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EVERYDAY PSYCHOLOGY FOR TEACHERS

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BY

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TO

MY WIFE

OLIVE FOSTER BOLTON

THIS VOLUME IS

AFFECTIONATELY INSCRIBED

PREFACE

During the last decade a marked interest in the scientific study of education has developed. One of the results of this increased interest and more intensive study is the additional requirement of educational psychology in all teacher-training courses. Many laymen, indeed, have become interested in educational processes to a degree greater than ever before. Much that may be legitimately treated in a course in general psychology is of purely academic interest and has no value for education. Therefore some topics that appear in works on general psychology are not included here.

This book has been written for this ever-widening public—the young teachers who wish to get a right start in their profession by becoming acquainted with the principles of the subject; the older teachers who wish to have the results of experiment and research that have met with most favor; and that great number of persons interested in the subject of education who have faith in the boys and girls of to-day and wish to have a part in making them the worthy citizens of to-morrow.

A trio of great Americans, G. Stanley Hall, William James, and John Dewey, who are destined to receive very generous consideration in the history of education, have influenced the writer more consciously than all others. His obligations to them are apparent on every page.

F. E. B.

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PART I

INTRODUCTION

EVERYDAY PSYCHOLOGY FOR TEACHERS

CHAPTER I

SUCCESSFUL TEACHING BASED ON SCIENTIFIC KNOWLEDGE

Professional Training Recent.—Only within comparatively recent times have teachers made any serious, special preparation for the most responsible work one could undertake. Even after it came to be acknowledged that teachers should possess good scholarship in the subjects to be taught, it was not urged that they should possess that which is equally important—a knowledge of the child and skill and technic in teaching. Thanks to some of our great leaders, however, the time is approaching when each teacher must have expert knowledge of children's development and scientific methods of leading and instructing them. No one will be permitted to teach who merely copies blindly what other teachers do. They will need to know why they do certain things and how to meet the needs of each child under their care.

Science in Other Occupations.—No farmer would be considered intelligent and expert who continued to plant corn in the way his father had done or who merely copied his neighbors. The expert farmer must know, for example, the composition of varieties of soils, the kinds of plants adapted to each, the effects of moisture, and the purpose of cultivation. In short, he must understand the laws of growth and what will promote best in a particular case. Similarly, in raising cattle, horses, or hogs, the successful breeder cannot be a blind follower of tradition. He must know general laws of growth and also know how to contribute to the needs of each particular animal.

Medicine has been elevated to a profession by substituting scientific knowledge for tradition and guesswork. Manufacturing owes its phenomenal advance to the employment of armies of technically trained scientific experts. The application of scientific methods to transportation, commerce, and employment management are changing their status to a professional basis.

Unscientific Experience Costly.—In business and industry to follow tradition blindly is exceedingly costly. In modern economic enterprises the one who does not utilize scientific methods finds himself distanced. Advantageous procedure may be discovered through experience only, but to follow the trial-and-error method often results in disaster.

The care and training of the precious lives of children should not be considered any less important. The teacher should be so impressed with the importance and responsibility of teaching that he will not be satisfied until every possible means of preparation is secured. Some one may say: "Can expertness be gained in any way except through experience?" Certainly experience ought to make one a more efficient teacher, but we should ask ourselves another question, viz.: "At whose expense shall we gain experience?" A renowned physician was once complimented upon his skill as an oculist. He said: "It is true that I have some skill in treating defective eyes, but in acquiring my skill, alas, I have spoiled a whole hatful of eyes!"

Lessons from Scientific Experiments.—If a farmer can get twice as large a crop by scientific methods of planting and cultivation as by traditional methods, he will certainly conclude that it pays to understand scientific methods. It has been demonstrated many times in recent years that the corn-crop could be doubled by scientific agriculture. Even boys and girls who have studied the subject scientifically have raised twice as much corn per acre as their fathers who had raised corn all their lives. The fathers possessed experience, but not scientific knowledge. Hence, their experience was of little value.

Experiments have proved that children can learn twice as much as they usually do while going to school, or that they can learn the same amount in half the time, or learn their lessons twice as well. Should not the taxpayers become aroused over the great waste of time and money? Many experiments have been conducted in which children omit all formal study of arithmetic in the first two grades. By the end of the fourth grade such children are as far advanced as those who have had the subject four full years. Again, children will acquire two or three foreign languages without difficulty and speak them perfectly, while grown persons have great difficulty in mastering a single foreign language. What would we think of a circus manager who tried to train old men to become trapeze performers? Oftentimes there is more scientific knowledge displayed in training circus animals than in training children in public schools. Thousands of children have become nervous wrecks because they began reading and writing before their minds and muscles were fitted for the task.

Pupils used to attend school a year or two before being able really to read. They were taught by the alphabet method, a method which is absolutely unscientific for teaching beginners to read. A study of the psychology of learning led teachers to doubt the method, and to experiment with the word and sentence methods. Now, skilful primary teachers enable children to read intelligently stories, even as difficult as "Hiawatha," within four months. The recent emphasis upon "silent reading," which is not a new method but was used by the writer thirty years ago, is giving results that should easily convince the most sceptical that scientific teaching yields results that save the taxpayer's money and save the precious time of the children. That scientifically trained, skilful teachers can produce more efficient results than the untrained and unskilful has been demonstrated beyond the shadow of a doubt.

Some Causes of Failures.—John may have failed to get his arithmetic lesson, not because the teacher did not know enough arithmetic, but because John was not in a condition

to receive what was imparted. A dinner of doughnuts, hard-boiled eggs, and mince pie had drawn the blood from his brain so that he was too sleepy to understand arithmetic. Mary may have lain awake the night before dreading the examination. Another child has come to school without breakfast, another has had to get up at four o'clock to help his widowed mother, another child has defective vision and has been left on the back seat to strain his eyes, and even then to see things in a distorted manner. No wonder that some of them find trouble with their studies, fail in examinations, and finally quit the struggle altogether. Then there are children who are utterly incapable of doing the regular work of the school. Intelligence testing has revealed in an unmistakable way that there are great mental differences among children, and that some in school should be in special institutions. How many of the vast numbers of children who drop out of school might be retained if teachers only understood children's minds better! How many boys and girls have been drawn from the home, often to become outcasts in society, just because father, mother, and teacher failed to understand them at the critical age of youth!

Importance of Knowledge of Children.—A knowledge of the child is the most fundamental and important part of the teacher's preparation. Many teachers with thorough knowledge of their subjects fail because they do not understand the boys and girls who are to be taught. Many assume that children are like plastic clay and can be moulded at the will of the teacher. Any observing parent or any intelligent teacher of experience knows better. Boys and girls are not passive lumps of clay; they are living, pulsating, developing, mysterious beings, who must be studied and understood before they can be taught in the true sense. The boy who sits before the teacher is in reality a very different being from what he appears to be, and only the teacher who can fathom those mysterious impulses which make up the life of every boy can ever hope to be his true teacher.

Only recently have we come to realize that the most difficult

factor in education to understand is the mind of the child to be taught. We may know subjects, and we may know problems of life and the relation between these two, but we must also know how each of them appeals to the child before us and how to use the school and environment so as to stimulate this budding, pulsating personality and cause him to unfold his higher potentialities and become a vital force in promoting the welfare of the world. The way to do this? No better answer has been given than the scriptural answer: "A little child shall lead them."

Care for the Child's Health.—The young person on beginning the important work of teaching is quite apt to think at once of reading, writing, arithmetic, and other subjects of instruction as the main things in connection with her work. Too often the physical health and welfare of the pupils are overlooked, or left to chance consideration.

Ability, experience, genius count for notning when health fails. Business men are coming to recognize this and to give more attention to their own health and that of their employees. They understand that poor health means inefficiency, and inefficiency means decreased profits. School hygiene, both of body and of mind, have come to have an important place in the training of the teacher.

Child Psychology Determines Methods.—A knowledge of children's minds and the way they work is certain to convince one that in order to teach efficiently we must get the child's point of view. Many well-conceived aims of education do not bear fruit, simply because the teacher does not understand the workings of children's minds. The teaching is done in terms of adult thinking and means nothing to the child. The child mind understands concrete things rather than abstractions. We must appeal to the child through his every-day experiences and on the plane of his stage of development. Instead of beginning with definitions, abstract principles, and laws, the meaning of them should first be made clear. Otherwise the statements are empty words. Every concept should have its concrete examples to which the mind can turn for

illustrations at any time. Any attempts to foist abstractions upon the child will produce but a veneering that is sure to scale off. Unless they can form concrete images which may be used as measures of the thing talked about, the idea is hazy and fades quickly. Those ideas which have been built up either through sense-perceptions, bit by bit, or through imagery in much the same way are the ones that persist.

We constantly appeal to the child through our own experiences instead of through his. We expect him to comprehend the complex abstractions and the conventionalities of which we speak to him in an almost unknown tongue. Christ as a teacher was far wiser. Notice how he selected his illustrations from the every-day life of his hearers. Though a carpenter himself, he never used illustrations from that occupation, but he recalled his hearers' experiences as shepherds, as husbandmen, as fishermen, etc. Illustrations leading up to great truths were always selected from experiences near at hand. He recalled the sparrow, the foxes, the lilies of the field, the seed-time and harvest, the sower who went forth to sow, the manna in the wilderness, the widow's mite, the Pharisee and the publican—objects with which they were all familiar.

Instruction of children should begin with experiences personally familiar to the particular children taught, and make the teaching radiate from those. The point of contact for the city child is of one kind and for the country child another. Children appropriate words so easily that they frequently deceive others into thinking they possess real knowledge when they have absolutely no comprehension of what they are talking about. Doctor Dewey says:

> While I was visiting in the city of Moline a few years ago, the superintendent told me they found many children every year who were surprised to learn that the Mississippi River in the text-book had anything to do with the stream of water flowing past their homes.

Teachers Must Be Masters of Subjects.—It should be self-evident that the teacher should understand thoroughly the

subject to be taught. The teacher whose knowledge of arithmetic, geography, or history is inaccurate or narrow must fail utterly to inspire confidence in pupils. The teacher should not only be able to comprehend the subject taught, but should have such a thorough mastery of it and have it so pedagogically organized that he can present it clearly, concisely, and forcefully. The teacher's knowledge should be so broad and thorough that if the pupils cannot understand one illustration, others can be given immediately. No two pupils learn in the same way, and consequently the teacher must be so familiar with the subject that he can see it from every angle. Not only must there be thorough mastery before beginning to teach the subject, but there should be daily preparation with each particular class in mind to make the subject fresh and stimulating.

Teachers Must Know Life Outside the Schoolroom.—Inasmuch as the school subjects are only means to an end—that of understanding and mastering the problems outside of the school—and since a large part of real education is derived through life outside, it is necessary for the teacher to know something besides the formal school subjects.

In order to connect the child's schoolroom experiences with life experiences outside, the teacher must know life beyond the four walls of the school. Too many teachers know little of the great bustling world and its hum of industries. They live a cloistered life, and what studying they do is confined to the text-books from which they teach. Text-books and formal lessons are but a means to an end, viz.: that of enabling pupils to acquire something through which they can interpret life and solve some of its problems. If schoolroom education is to do that, the pupils must see the significance of the things they do in the school. That means that the teacher must understand the relation of the formal subjects to life outside and a knowledge of the workings of the child mind whereby the child can be made to understand those relations. If a boy once sees that geometry and spelling are important in accomplishing the things which he wishes most of all to do,

there is little difficulty in getting him to study diligently. Therefore the teacher of spelling and geometry needs not only to know spelling and geometry, but how those are involved in the boy's interests. The largest problem of the Latin teacher to-day is not in imparting instruction to pupils in correct Latin, but in getting boys and girls interested in studying Latin. That can be done by making it significant in relation to life's problems.

The teacher should know industrial life through contact with it, geography through personal experiences, history through observing it in the making, civics through being a wide-awake, intelligent, participating citizen, literature through watching its production in the magazines and books of to-day.

The Teacher's Problem Summarized.—In view of the foregoing it is obvious that the teacher who wishes to become a master craftsman must make a careful and prolonged study of his profession. He must understand that art and skill in this noble profession are based upon scientific principles the same as in other callings. While teachers "are born, not made," the same is true of lawyers, doctors, and engineers, and all, while born with the potentialities, must be developed through mastery of the fundamental laws of their work.

The teacher should ever keep in mind that, in order to succeed, a trinity of ideals must ever be kept in the foreground, viz.:

1. A clearly defined aim of education in general and of the particular problem under consideration.
2. A knowledge of the great world about the child and the child's present and future place in it.
3. A knowledge of how to make the subjects of instruction contribute to those aims. This will mean (*a*) mastery of subjects of instruction, (*b*) a thorough knowledge of the child mind and its workings, and (*c*) technic and skill in guiding the child.

Results Already Apparent.—Not only has increased skill in teaching secured greater efficiency in results, but the content of the curriculum has been wonderfully improved. Schoolbooks and schoolroom exercises connect with life in such a vital way that school is an interesting place to most children. The old-time picture of the whining schoolboy is absolutely misleading. Children now really like to go to school. Also the things learned in school do have a much more vital relation to later life than formerly. So interesting and vital have the school activities become that the drawing and holding power of the school is rather astonishing. In our city (Seattle, Wash.), of the 2,000 children finishing the grammar grades in June, 1921, over 90 per cent were found in the high schools in September of the same year; and of the 1,400 finishing the high school the same year, about 65 per cent were found in college or normal school at the opening of the fall terms. Fully 10 per cent more will enter higher institutions of learning within three years after graduation from high school.

The science of education may be credited with most of these achievements. By studying the meaning of education in terms of life, by selecting content to make vital these relations, by studying the needs of society and of individual boys and girls, and by developing a science and art of teaching, these great changes in education have been brought about. The public seldom thinks of the teacher as being responsible for these changes. But were the professional training of teachers to be abolished for a decade, the whole structure of education would begin to totter.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Show the types of progress made in farming since your parents were children. 2. To what extent has farming been made scientific? 3. Has farming been made more attractive and remunerative thereby? 4. What are some of the evidences of a new science of education? 5. Is education more efficient now than in the "good old days"? 6. Suggest some types of educational procedure that are still carried on in traditional ways. 7. What countries have made their education most scientific? Reasons.

References for Further Reading

1. Bolton, *Principles of Education*, chap. I.
2. Dewey, *The School and Society*, chap. I.
3. Dewey, *Schools of To-morrow*, chap. I.
4. Judd, *Introduction to the Scientific Study of Education*, chap. I, XXII.
5. Thorndike, *Principles of Teaching*, chap. I, XVI.
6. Tyler, *Growth and Education*, chap. I.

CHAPTER II

MEANING AND PURPOSE OF EDUCATION

Popular Notion.—Usually, when the term "education" is mentioned, people think of the formal work of the schoolroom. There arise visions of reading-books, arithmetics, grammars, and children gathered in classes reciting lessons, pictures of classrooms, library, and laboratories. True, these are connected with the formal educational process, but are they indispensables or even essentials?

In reality, men were educated long before the days of schools such as we now know them. In the days of ancient Greece men whose names we have cause to remember had little or no formal schooling. Even reading and writing are not absolutely necessary accomplishments. We are told that the Homeric poems may have been composed and passed on orally long before they were penned. In ancient times the slaves learned reading and writing. The freemen, their masters, did not need to, as the slaves could do these things for them.

Few of our ancestors but a half-dozen generations back could read and write. But were they uneducated? Could they not do well a great variety of things that we cannot do? They were highly trained and skilled in the arts and crafts necessary in their environment. Their minds were as keen, alert, and well trained in thinking as those of men to-day. In what manner were their training and development secured? By the very types of things which educate men to-day, far more than through books and schools. Some of the means will be mentioned.

The Home as an Educator.—First consideration should be given to the home. This is the first institution to touch the life of the individual, and in many ways the most influential. Though the school and one's business or profession give more

definite mastery of technical accomplishments which come to be regarded as the fruits of education, yet the use to which these will be put is largely determined by the ideals in the home. Religious creeds are learned at the mother's knee, political beliefs are acquired in the family circle, and social ideals largely determined by family customs. Honesty, veracity, politeness, good manners, clean living, and temperance are most easily taught in the home. Likewise, on the other hand, immorality and unrighteousness may be generally traced to undesirable home influences. In fact, the ideals which dominate life and character and give them significance owe more to home influences than to all others combined. So important is this early formative period that some of the churches say: "Give me the child for the first seven vears, and the world may have him the rest of his life."

Other Institutional Influences.—Besides the home, there are many specific institutions and activities that educate as effectively as do the schools. For the great mass they provide the major portion of training. All forms of occupation furnish training and extension of one's horizon. Various scientific, historical, and literary societies, clubs, lodges, labor organizations, and guilds encourage the social instinct and give intellectual and moral uplift. Then special means are employed to supplement the schools, such as lecture courses, public libraries, reading circles, chautauquas, and reading-rooms. The daily newspaper, the magazine, the telephone, the telegraph, commercial intercourse, furnish knowledge and incentives for learning, and supply outlets for activities that modify the thoughts, taste, and conduct of the individual. Even plays, games, sports, and pastimes are of moment in developing latent capabilities and in stimulating new ones. In determining a boy's moral action the neighborhood environment and the neighbors' boys are more instrumental than the school.

President Butler says (*Meaning of Education*, p. 13):

The doctrine of evolution teaches us to look upon the world around us—our arts, our science, our literature, our institutions, and our reli-

gious life—as an integral part, indeed as the essential part, of our environment; and it teaches us to look upon education as the plastic period of adapting and adjusting our self-active organism to this vast series of hereditary acquisitions.

Doctor Harris (*Psychologic Foundations of Education*, p. 266) emphasizes the importance of the state in education, and maintains that indirectly it is the most influential of all. He writes:

> The influence of the constitution of the state, and of its transactions with other states in peace and war, weaving the web of world history, is known to be more powerful in educating the individual and forming his character than any of the three phases of education mentioned (home, school, church), for it underlies them and makes possible whatever perfection they may have. Without the protection of the state no institution can flourish, nothing above savage or barbarous human life can be realized. . . . The state is the essential condition for history. . . . History commences with the evolution of man's substantial self and its realization or embodiment in a state.

Farm Life.—The duties and environment of the farm are often thought to be directly opposed to education. But well-ordered farm life offers the most advantageous sort of environment and discipline that childhood and youth can have. At its best, when made significant through books, good schooling, and the intelligent leadership of parents, it affords certain educative means that money cannot purchase in crowded cities. The outdoor exercise and healthful recreations develop firm muscles and red blood, healthy brains, and vigorous constitutions. Farm duties bring a sense of responsibility, so often lacking in city-bred children, and also secure motor training invaluable for all future accuracy of work and for will development. President G. Stanley Hall said:

> Of all work-schools, a good farm is probably the best for motor development. This is due to its great variety of occupations, healthful conditions, and the incalculable phyletic reinforcements from immemorial times. I have computed some threescore industries, as the census now classifies them, that were more or less generally known and practised sixty years ago in a little township which not only in this but in other respects has many features of an ideal educational en-

vironment for adolescent boys, combining as it does not only physical and industrial but civil and religious elements in wise proportions and with pedagogic objectivity, and representing the ideal of such a state of intelligent citizen-voters as was contemplated by the framers of our Constitution.

Because of its opportunities for immediate and prolonged contact with nature there is offered the best possible preliminary nourishment for the understanding and appreciation of science, literature, and art. Here is offered the chance to find "tongues in trees, books in the running brooks, sermons in stones, and good in everything."

The Playground.—The function of play as an educative factor is beginning to be realized. It is not long since play was regarded by many serious-minded people as sinful. Its biological and social significance were not understood. Now play is regarded as a fundamental instinct whereby the child secures necessary relaxation and invigoration and also the unfoldment of manifold natural powers. To work properly in adult life there must be natural and abundant play in childhood. Bagehot wrote:

> Man made the school, God made the playground. Before letters were invented or books or governesses discovered, the neighbor's children, the outdoor life, the fists and the wrestling sinews, the old games (the oldest things in the world), the bare hill, the clear river—these were education; and now, though Xenophon and sums become obsolete, these are and remain. Horses and marbles, the knot of boys beside the schoolboy fire, the hard blows given and harder ones received—these educate mankind.

The great educative value of play will be discussed more fully in a separate chapter.

Influence of Chance Environment.—Not only purposive influences educate, but also all chance environment. The slums educate as forcibly as do Grand Avenue, the church, and the school; a candidate for the penitentiary helps to educate our boys no less than does the Sunday-school teacher. Sometimes the chance and baneful education is more forceful than the designed and elevating. According to Spencer's definition,

the purpose of education is to prepare for complete living. This even is a conception of an ideal education. Dewey has defined the term in a much more fundamental sense by declaring that education is not solely a preparation for something in the future. It may include that, but there is something more basal. Education, he says, is life itself; and conversely life is education. Here is the only conception which is broad enough, even when we consider ideal education. According to this conception every individual becomes educated; in fact, none can escape it. Even the lower animals, as well as man, undergo education, for their experiences bias their future conduct.

Influence of Primitive Arts and Occupations.—The stride from savagery to civilization was a part of race education. Through the long struggle there were no schools except the effective school of experience. In this struggle with the elements, with wild beasts, and with each other, men were taught many things. Whenever one is taught anything or learns anything there is education. Primitive men for long ages were learning how to make implements for warfare, for the hunt and the chase; learning to make fire, how to cook, and how to spin and weave; how to clothe themselves, provide shelter and protection; how to plough, plant, and harvest; how to cure disease and avoid pestilence; learning methods of transportation, barter, and exchange; learning how to dig, smelt, and fashion the ores; how to utilize the wind and water, and employ the simplest mechanical principles. They have influenced profoundly the whole character of subsequent history.

We are prone to forget that the school of experience has been in session since the world began, and there have been no vacations. Nature has not missed assigning a single lesson. The credits received for the training have been recorded with absolute fidelity. The education which man has received in this wise is incomparably greater and the results are much more enduring than the results of a few centuries of formal education since schools began. In cudgelling his brains for some new school arts which might interest and profit the chil-

dren it would be well for the schoolmaster to take a retrospective glance and pass in review the school arts which Mother Nature has employed. If he can discern anything which is related to getting a living, providing food, clothing, shelter, amusement, or advantages, there he will find an interesting and effective school instrument. Utility has been the watchword of nature; it should be the schoolmaster's.

School an Interpreter of Experience.—The school should be the most effective educational institution. It should be, and is coming to be, the institution which co-ordinates and interprets all the experiences of life. The school studies principles of life rather than mere mechanical modes of immediate use in gaining a livelihood or deriving momentary pleasure and happiness. It thus furnishes an interpretation of life and gives significance to all other modifying influences. It looks to the future more than to the immediate present. The school is the standard-bearer of the highest ideals of the present and of the past. Advanced forms of schools, also, seek to discover new truths and new ideals, and thus become not only guidons of established forms of conduct, but heralds of new ideals. Through research the universities have been the greatest factors in advancing civilization.

The Child the Centre.—But even after cataloguing all the ideals of education and all the institutions and agencies that influence the individual, we have considered education from only one side. Such a procedure is like a study of "Hamlet" with Hamlet left out. Modern educational inquiry has come to study not only ideals and agencies of education, but the central figure in the process—the child. Nature has been proceeding slowly, steadily, for eons in the production of the crowning product of evolution, and if we would educate wisely we must spell out at least the fundamentals of the secret. Though we may utilize artificial substitutes here and there, yet all must be in harmony with the ways found efficient in ages of experimentation. The modern educator is admonished to go to nature, consider her ways, and be wise. The latter part of the nineteenth century deserves lasting credit

for centring the attention of educators upon the child instead of the curricula. Though not losing sight of ideals and means, an effort is made to understand these in relation to the developing being.

Spencer's and Dewey's Interpretations.—At a time when school education was very formal, bookish, and unrelated to life activities after school-days, Herbert Spencer said: "Education is a preparation for life." He brought about a new evaluation of the purposes of school education and secured a wider introduction of the sciences and practical studies. That was of untold benefit, as the Middle Age type of education was largely valueless for the masses. Universal education could never have become a reality with the old curriculum.

Spencer's contribution was of immense benefit, but as misinterpreted by many it loses half its value. By many in this money-making age of industrialism and materialism it has been construed to mean "prepare only for the industrial and commercial needs of society as seen by the adult."

A few years ago a questionnaire was submitted to a group of business men and a group of teachers, asking what they regarded as the most important subject in the elementary school. The business men said "arithmetic." They were thinking of education as a process of providing children with knowledge and skill which the pupils might use later in the service of the business men. They were thinking of education from the traditional point of view. They were thinking of providing tools for the use of society. They were thinking, also, of providing special tools to use in their own particular occupations.

According to the "bread-and-butter" or commercial idea of education, we should study the industrial life about us and then select those things that the child will be supposed to need in later life, or that the industries may need to make them efficient. This is exactly what has occurred and is occurring. The business man thinks of something that will promote business efficiency and then asks that it be placed in the school curriculum.

Now, some arithmetic will be desirable, but the primary child does not need to know much of the business man's arithmetic. The business men were thinking of the great need for good bookkeepers and accountants, and also of the fact that many school graduates are wofully lacking in arithmetical knowledge. Consequently they said: "Arithmetic is the most important thing for the school to teach." By the same process of thinking business men often decry the results of public-school work in subjects like arithmetic, spelling, and handwriting. Alas! the results are oftentimes very disappointing. But do the schools exist only to prepare for business or trade efficiency? Whenever the business man sees demands for new lines of business efficiency he immediately urges that courses be put into the schools to train for those demands. Thus have arisen courses in typewriting, stenography, manual training, journalism, engineering, fisheries, and agriculture. These are all very commendable, but when all trade and commercial subjects have been included and taught efficiently education will not be perfect. There is another side to education. Adult social needs are not the only ones to be considered.

The majority of teachers did not answer that arithmetic is the most important elementary school subject. They answered: "Reading and play." They did not specify reading simply because it is a tool in the acquisition of knowledge. They were thinking of reading as furnishing high ideals of life, as a means of stimulating the higher and finer emotions, and as a means of awakening the latent powers of the child mind. They thought of play as an activity for which the child has an instinctive craving, and when without an opportunity to cultivate it the child grows up malformed in mind and spirit, often becoming the adult criminal. Those teachers were contemplating education as a means of stimulating and unfolding the innate powers and potentialities of the child.

John Dewey improved Spencer's definition of education by saying: "Education is not a preparation for life, but education

is life itself." Now what did he mean by that? He recognized that each child is endowed with natural impulses to do certain things at certain times, even though the activity may not seem to have any use to adult society. For example, all normal children, when left to themselves, begin to play. If a child does not play we rightly suspect that the child is sick. We notice also that children are not very old before they show definite pleasure at being with others and distress if left alone. They naturally congregate in groups to play. When about a year and a half or two years of age the child begins to talk without compulsion. They seem to delight in the process, especially when they discover that they acquire personal advantage. Consequently we must recognize these natural tendencies, give them a chance to develop, and aid the child to do what he then, as a child, wishes to do.

Dewey also says (*Schools of Tomorrow*, p. 1) that Rousseau's "insistence that education be based upon the native capacities of those to be taught and upon the need of studying children in order to discover what these native powers are, sounded the key-note of all modern efforts for educational progress. It meant that education is not something to be forced upon children and youth from without, but is the growth of capacities with which human beings are endowed at birth. From this conception flow the various considerations which educational reformers since his day have most emphasized. . . . Schools are always proceeding in a direction opposed to this principle. They take the accumulated learning of adults, material that is quite unrelated to the exigencies of growth, and try to force it upon children, instead of finding out what these children need to know as they go along." The child should be doing in school the type of thing that he would do spontaneously outside the school. If we would select wisely the curriculum for the child we should "go to the child, consider his ways, and be wise."

The child gains outside of the schoolroom much of what is most significant. He spends, for a few years only, about six hours a day for 180 days yearly, in the school, while all the

rest of his time is spent in the home and other places than the schoolroom. Inasmuch as the average child gets only a sixth-grade education, it can readily be seen that the great moulding influences in the child's life are predominantly outside of the school. Therefore we need to recognize that the out-of-school experiences color all that is done at school, and, in fact, determine most largely what manner of men and women the children shall be.

If vocational efficiency is the chief end to be secured through formal school education, then on what basis can we justify teaching music, drawing, painting, dramatics, history, literature, civics, most of geography, the elements of the sciences? Even most of algebra, geometry, foreign languages, never have the slightest vocational value for more than 90 per cent of all pupils who pursue them in the elementary school and the high school. If this is true, some justification must be sought for mortgaging so vast a proportion of the time of such armies of children and youth. These subjects must also be taught with a different ideal in mind. An examination of many recent reading-books shows that a large proportion of the selections are made up of poetry, prose fiction, psalms, proverbs, speeches from Webster, Lincoln, Washington, and morality essays. Why should compilers of reading-books select those instead of rules on business efficiency, business law, office equipment, blacksmithing, automobile repairing, millinery, or dressmaking?

If those are legitimate selections for school readers, surely that ideal should stand out clearly in the minds of the teachers. Recently I asked a group of students in training for teaching why those selections should be included, and the prevailing answer was that the selections taught literary style! What a perversion of the Scriptures, Lincoln's Gettysburg Speech, or Washington's Farewell Address, if the only outcome is an accretion to literary style! The hearts of boys and girls should be thrilled by the Gettysburg Speech, high resolves stimulated by the Proverbs of Solomon, their whole lives motivated and poised by the great literature of all the ages.

Citizenship.—As the chiefest outcome of most of the studies of the elementary school, the high school, yea, even the college, should not high ideals of citizenship be pre-eminent? Good citizenship is primarily a matter of attitude—an attitude of individuals toward each other, of individuals toward society, toward their government, of governments toward individuals and toward other governments. Mere vocational efficiency does not insure good citizenship. Some of the most baneful and anti-social citizens are vocationally efficient to the highest degree.

The good citizen has the welfare of others at heart and uses his skill in the interest of society as well as himself. Should not the chief business of the school be to develop ideal citizenship rather than individual or national skill? This means primarily the stimulation of the finer emotions and aspirations of men so that their powers and skill shall be used in the interest of humanity. Many talk as if men were in danger of starving to death because lacking in the skill to gain a livelihood. There is far greater danger of moral and spiritual starvation than of physical starvation. The main reason why men starve physically is not that they are lacking in the knowledge, training, and skill whereby they may earn a living, but that either they will not work or the greed of others anti-socially disposed will not allow them to work.

Germany has long used the schools primarily as a means of developing citizenship. The vocational skill of her people has been acquired outside of school through the apprenticeship system. The result has been unrivalled vocational efficiency and an intensely loyal people almost blindly faithful to the citizenship ideals developed through the schools. Now, I cannot subscribe to their ideals of citizenship, but no other example illustrates to the same degree the efficiency of a school system in reflecting the national ideals and in turn moulding and creating those very national ideals. Let us discover the meaning of ideal citizenship and then consciously use the schools to develop those ideals in the minds of the growing citizenry. Vocational efficiency will largely take care of itself.

A friend of mine was engaged in work in the municipal government of New York City which caused him to see much poverty and destitution. He attributed these conditions to the fact that throngs of children drop out of school at an early age and enter unskilled, blind-alley jobs. This led him to say that all children should be taught only the rudiments of reading, writing, arithmetic, and geography. All the "fads and frills" should be cut out, such as music, drawing, painting, history, and literature. Then at about the fifth grade all should be taught a trade. He said they would then be able to go out into the world and earn a living. I could not resist asking: "Is that the kind of education you want for your boy?" He immediately forgot all he had said and replied: "Of course not, for *my* boy." No, it was for the *other fellow's boy*. We may generally assume that the one who wishes all enriching "fads and frills" cut out, is thinking of the other fellow's boy.

The success of even lawyers, doctors, or engineers, following supposedly very technical professions, is largely dependent upon other qualities than the technic of their professions. The Mayo brothers, Goethals, and Edison never would have become world-famous for technic had they not developed wonderful visions of service to humanity as their great motivating impulses. Each one doubtless has in his laboratories technicians with greater skill in manipulation than their master, but they have never been heard of because it is the great world ideal of human service that has revealed the master minds. Philosophers will be remembered longer than technicians. The education of the workman is as vital a problem as the education of the planner, but the workman must be taught to plan as well as to take orders and follow specifications.

Our greatest task in all grades of school is to develop large, broad-minded ideals of citizenship. It is a more difficult task than to train to skill and technic. In the world of civilization, one genuine leader with power to marshal the forces of nature and human skill and direct them to efficient service in

the interest of humanity, will mean more than a thousand hands with skill alone.

Vocational training must become thoroughly established and maintained. The man without a regular vocation in which he is reasonably efficient is a dangerous man. The nation without industrial vigor and efficiency is a decadent nation. Every man ought to have a means of livelihood. Every nation must encourage the handicrafts, trade, and commerce and secure efficiency in all of them. But are these all and are they most fundamental? Is there not danger that the ideal of efficiency in gainful occupations may crowd out all other ideals and its dominance mean danger? Efficiency in gainful occupations unmodified by higher ideals means selfishness and sordidness. Mere efficiency may crowd out all opportunity for fostering the development of altruism and of the finer sentiments contributory to it.

National superiority should not mean that that country is the greatest, the mightiest, which can achieve the most for itself, can most completely dominate all others for its own selfish ends. We should not alone ask how extensive its domains, how strong its army, how efficient its navy, how rich its mines, how fertile its fields, how shrewd its men. Should we not also ask how fine are its schools, how justly governed its cities, how empty its jails and poorhouses, how unnecessary its hospitals, how justly its laws administered, how free from vice, graft, and corruption, how charitable and magnanimous its people, how developed its ideals of freedom, what its rank in the world's democracy?

In this education for larger citizenship every means in every grade must be employed to instil worthy ideals of conduct and character. Every possible attempt should be made to awaken dormant consciences, to arouse the nobler sentiments, and to inspire manly and womanly impulses. Emotions are the mainsprings of life. Properly develop the nobler emotions and all else will follow—even efficiency.

Instead of following Huxley's idea that education should develop the mind into a clear, cold logic engine, should not we

also follow Milton, who says that education "fits a man to perform justly, skilfully, and magnanimously all the offices both private and public of peace and war"?

Education should be a means of awakening and ministering to all the higher instincts, a means of refining the soul and purging it of all that is base and ignoble, the means of stimulating to the highest forms of unselfish social service. The great problems of the world which demand immediate solution if our civilization is to endure are not questions demanding alone technical skill, but are great social and moral questions. There is skill enough, scientific knowledge enough available, if there were only courage enough, honesty enough, unselfishness enough in their application. No one of them demands any special amount of shrewdness or technical skill. A strict application of the Ten Commandments on the part of all men, on the part of all nations, would solve every really great question confronting the world.

Should another crisis come upon us or should new emergencies confront us, may we have as a national asset the contribution of the combined wisdom and insight of the home, industry, society, and political organization; emerging from the highest grades of our public schools a grand army of youth such as the world has never beheld, physically fit, strong of brain, sound in mind, with scintillating eye, senses alert, hands trained to a high degree of skill, with abounding patriotism, brave of heart, tempered in judgment, broadened in ideals of citizenship, ready to give all to the cause of human freedom, fraternity, and justice.

This is the task of education in all grades of our schools. The problem of education will become recognized as the problem fundamental to all others. Even that of war is less significant than ultimate education, for all war is occasioned by miseducation, and wars and rumors of wars shall not be banished from the earth till all men everywhere shall have become educated to the highest degree in the principles of true democracy, liberty, fraternity, equality, magnanimity, justice, and good-will toward all men.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Ask the first five persons you talk with why children should study arithmetic, music, literature, algebra. 2. Do their answers accord with the point of view of the author? 3. Why should your parents pay taxes to educate your neighbor's boys? 4. Are highly educated nations most efficient? most honorable? 5. Can a nation determine its destiny through education? 6. Mention three nations that seem to have accomplished that. 7. Should education be vocational? Meaning of vocational? 8. Should foreign languages be studied? 9. Why not teach trades to children of 10 years? 10. Why not teach trades in apprenticeships instead of in schools? 11. Discuss: "The public school should keep pupils out of vocations as long as possible and not hurry them into earning."

References for Reading

1. Butler, *The Meaning of Education*, chaps. I, II, III.
2. Dewey, *Democracy and Education*, chaps. I, II, III, IV.
3. Dewey, *The School and Society*. Entire book.
4. Hanus, *Educational Aims and Educational Values*, chap. I.
5. Judd, *Introduction to the Scientific Study of Education*, chaps. III, IV, IX.
6. Miller, *Directing Study*, chaps. V, IX.
7. Smith, *An Introduction to Educational Sociology*, chap. I.
8. Suzzallo, *The School as a Social Institution*. Entire book.

CHAPTER III

HOW TO STUDY EFFECTIVELY

Importance of Efficiency in Study.—It may seem superfluous to give advice on how to study. Many think that all they have to do is to "just study." Teachers, however, continually complain that pupils are inefficient in study. They frequently lay it to indifference and indolence, but some recognize that pupils do not know how to study and have not formed good habits of study. Several years' experience in giving a course to university freshmen in "How to Study" has convinced me that students do not know how to study efficiently. Many of these students have expressed regret that they had not had such a course in the high school. They believe that it would have given them a higher efficiency as students. They now economize their time, doing their work more quickly, and getting more certain results. Consequently this chapter is written with the hope that it may prove suggestive to prospective teachers in improving their own methods of study and that they may help others to become efficient. Undoubtedly the average student could secure 50 per cent better results by improving his methods.

A Definite Programme.—Each one should lay out a definite daily and weekly programme and adhere to it. Pupils in the elementary and high schools have their schedules largely determined for them. There are fixed hours for recitations, laboratory, and shop periods, and even their play hours are arranged and fixed. The study hours are also to a large extent fixed. This is especially true under supervised study plans.

But when a student goes to college or the normal school only the recitation, laboratory, and shop periods are arranged by the faculties. The students are left to their own initiative

to make study schedules. The result is that many students study irregularly and in an aimless manner. Sometimes they prepare their lessons immediately after a recitation, sometimes immediately before; sometimes the work is done carefully, sometimes slighted—and sometimes not at all. If the classes are large and students are not tested regularly on their work they fall into habits of taking chances of being called upon and assume that getting caught once in a while will not be very serious anyway. Thus the most slovenly habits develop.

When to Prepare Lessons.—The best time to prepare the next assignment is immediately after the day's discussion. The questions to be considered are fresh in mind, the incentive to inquiry is recent and stimulating, and the momentum gained is worth capitalizing. To postpone the preparation until just before the next recitation is wrong psychologically because the student tacitly says: "I shall depend upon catch words and recency of impression rather than upon thorough comprehension." When studying just before recitation, insufficient time is usually given, and the student is in a state of undue nervous tension, fearing that the task will not be completed. Work that does not depend upon a trip to the library or the laboratory should usually be done in the evening. Then the work may be undertaken deliberately, without hurry or worry, and as a rule it will be well done. If it can be reviewed in the morning before class, that will be found advantageous.

Adequate Time Necessary.—Most students are unwilling to spend an adequate amount of time in preparing their work. The average college student seems to think that an hour is sufficient for any lesson. Most high-school pupils regard a half-hour as sufficient. Though no amount can be prescribed, because assignments and abilities vary, it is safe to say that most students spend only half or two-thirds enough time to master their assignments properly. Of course, they should not be encouraged to spend more time in accomplishing the usual results. Doubtless they already spend too much time for the results secured. But more time properly spent would

make the results more accurate, more extensive, and more lasting. When inadequate time is given the result is careless, superficial work. Consequently, when the teacher probes, only shallowness and inaccuracies are discovered. Mere calling of words or skimming of head-lines does not allow time for reflection and analysis.

Undivided Attention Necessary.—Concentration of attention is absolutely necessary to secure efficiency in study. The "wits that go wool-gathering," the body that is at school while the mind is at home or on last night's party, all spell failure in study. To stimulate and gain the attention to the work in hand one must put himself in the right situation and right attitude. Sit down at the desk in the position of study, turn away from the window; do not have the newspaper, the letters from home, or the football trophies within reach; open the book and, if necessary, begin to mark the book (if your own), jot down notes, and ask yourself searching questions. Half the battle is in starting. The tempter says you need a drink of water, an errand needs to be done, you must figure up your accounts, you have forgotten a telephone call, your finger-nails need trimming, or your shoes must be polished. Sit down, take your pencil, and begin to write. If impossible to hold the attention easily, require yourself to write out exactly some definite point in the lesson. The habit of attending will grow, and likewise the habit of dawdling grows even more rapidly. Some one has said: "There is one safe, serviceable, indispensable, attainable quality, that of attention; it will grow in the poorest soil and in its own time bear abundant fruit."

Have Proper Surroundings.—It is very important to have suitable conditions under which to study. For example, there should be a proper desk, appropriate light, a quiet, properly heated and ventilated room, the right pencils, paper, and books. Such details determine more than most people recognize the degree of success in study. It is true that the majority of students in our high schools and colleges do not have satisfactory conditions under which to study. In a scale of

efficiency rating undoubtedly many would be rated as low as 50 per cent.

Analyze the Problem.—At the outset, in preparation of a lesson, analyze the problem in order to determine the vital things to be accomplished, the point of view, the order of importance of the things to be learned, and the method of learning required. A spelling lesson or the multiplication table needs to be learned in a mechanical order, and drill is the secret of success. They are things that need to be reproduced mechanically through life, and consequently require to be memorized exactly.

But a history lesson, for example, does not need to be frequently reproduced in some definite form. Its effects should be like the good counsel of friends, the knowledge we get through every-day contacts with our acquaintances, the facts gleaned from the newspapers, the interpretations of life made in magazine essays and every-day conversations, or sermons from the pulpits. Which of us adults would think of memorizing those verbatim or any other way? But we learn through all of them. History gives a point of view. Its orderly unfolding by the historian should aid in getting that point of view and give a critical attitude toward social experiences. In a similar way a beautiful poem should give a thrill of emotion and not mere intellectual facts. Hence history and literature should be studied largely for appreciation and not to secure tool facts. This will determine the method of studying them. In studying a lesson in quadratics, electricity, the chemistry of combustion, or a psychological theory, the end should be genuine comprehension and understanding. Mere verbally memorized statements will be of slight value. To retain the idea they must first be really known and once comprehended they will never be forgotten.

It is well to read hastily the entire lesson to determine the general problem, to note the large sub-topics, and to decide on the method of attack. After the first hasty reading, close the book and see if the main points can be jotted down from memory. To assist in securing accuracy it is well to select

some of the most difficult points and write them out carefully. Go over what is written and criticise it mercilessly, and revise and rewrite. Often it is well to try to explain a point to some one else. It is also valuable to have others criticise what one has written. Frequent reviews of what has been gone over are absolutely necessary. Teachers should require some reviewing, but the real student initiates most of his own reviewing.

Topical Study.—In making a study of a topic for a paper, a debate, or an oral class report, the first thing is to analyze the topic to know clearly what is to be done. Ordinarily the beginner selects altogether too comprehensive a topic. Instead of taking a topic like "Suffrage," it would be better to take a minute and definite one like "The Beginning of Woman Suffrage in Washington," or "Should there be a Property Qualification for Voting?"

Before reading a word or consulting any one, jot down an outline of the points recalled. State briefly your views and conclusions, then begin to read, make card references, brief analyses of the articles, confer with others, and gather quotations. Then revise the outline, and begin to write on the subtopics.

Taking Notes.—Note-taking by college students has become a prevailing custom, and occupies much time. Students and instructors generally believe it is very necessary. Many students write voluminous notes in class; some rewrite them after class. Many instructors require notes on their lectures to be handed in by the students. The notes have small value, but are required largely because of tradition. Long ago I gave up requiring students to hand in note-books on the lectures. Students soon discover where well-arranged note-books may be secured and copied. Even if they were absolutely independent the values are questionable. The student who takes full notes usually does so with the idea that by getting the words of the lecturer he will later be able to review the notes just before examination and thus pass successfully. In such cases the final examination plays an undue rôle in the course

and the instructor requires very little reading. He assumes that he is supplying all the necessary information. There is also usually very little recitation or discussion where the "lecture-note-book method" is followed. It is a delusion to expect that the ideas will be really comprehended and digested when so much dependence is placed upon the instructor's words alone. While taking the notes the attention must of necessity be divided between listening and taking the notes. There is also a subconscious feeling that understanding is to come about when reviewing the notes. Usually they are reviewed so long after being taken that the words fail to suggest the ideas intended.

There are some kinds of notes that have a high value. Laboratory notes on experiments and observations made independently should be required regularly. The problems set should be written up during the laboratory period, and the conditions made such that independence of observation and expression are secured. Note-books that are copied or constructed by another are not only valueless as an intellectual method, but are absolutely vicious morally.

Occasionally it is well to have the students write a résumé of a lecture topic or a reading topic for the practice in organizing material and formulating expression. Then, also, there should be opportunity to write themes in connection with each subject. In taking the lecture notes the student is merely writing the teachers' ideas in their words. There should be opportunity to organize his own thoughts, according to his own arrangement and in his own words. Notes of that kind have real value.

Card-Catalogue Notes.—Students should form early the habit of making a card catalogue of books, articles, and references that bear upon their studies or upon things that are of special interest to them. The card reference should contain (1) the name of the author, (2) the exact title of the book or author, (3) the number of pages, (4) the exact volume and year of publication, if in a magazine, (5) a brief digest of the contents—just enough to characterize the material. The

cards have a manifest advantage over the note-book because they can be sorted and rearranged as necessary.

The Lecture Method.—There is absolutely no justification of the traditional, formal lecture in elementary courses for the purpose of imparting information. There are no high-school or elementary college courses for which the information is not more systematically and accurately arranged in some good text-book than in the lecture. Informal talks pointing the way, indicating the significant points to seek, raising questions, defining them, and stimulating motivation undoubtedly serve a valuable purpose in learning, but as a purveyor of definite information they are of slight value. The formal lecture method teaches students to avoid reading and to be superficial students. In pioneer fields such lectures might be valuable, but there the seminar method is used, which means individual research. The "socialized recitation," where results of "project study" are pooled for the benefit of all is also more efficient. Why not more of the real seminar method with college freshmen and high-school pupils?

Student Initiative.—Students who study merely to pass examinations or to satisfy the teacher never make much real progress. In order to study efficiently there must be a feeling of worth-whileness on the part of the learner. The moment that a student develops a real personal interest in improvement and takes himself in hand, that moment he is on the highroad to real scholarship and his achievements are broader, more accurate, and more lasting.

It is unfortunate that so much study is done merely as a matter of prescription. There are so many units in the course, so many credits to be made, so many days to be in attendance, and all the ingredients put into the hopper are supposed to make an educated individual. But the number of pages covered or the credits gained do not make an education. How vitally has the boy been stimulated, how great are his resolves, how grippingly has the subject laid hold of him, are vastly more significant. His intensity of effort, his tenacity of purpose, candor and honesty with himself, his de-

votion are far better indexes of progress than the teacher's grade-book.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Jot down a brief statement of your usual habits of study. 2. Be honest with yourself and tell wherein your habits of study have been faulty. 3. Characterize the habits of study that your chum follows. 4. What are the usual plans? 5. Do you believe that habits of study as suggested in the text would improve (*a*) the exactness of your work, (*b*) the amount learned? 6. Point out three of the principles that seem to you most worth while. 7. Are you willing to try those three faithfully for a term? 8. Have you come across any good statements regarding study elsewhere? 9. Point out the characteristics of your ideal student.

REFERENCES FOR FURTHER READING

1. Dearborn, *How to Learn Easily*, chaps. I, II, VI.
2. Earhart, *Teaching Children How to Study*, chaps. I. II.
3. Kitson, *How To Use Your Mind.* Entire book.
4. McMurry, *How to Study and Teaching How to Study*, chaps. II, IV, V, VII.
5. Miller, *Directing Study*, chaps. III, V, VII.
6. Sandwick, *How to Study and What to Study*, chaps. I, II, III, IV, IX.
7. Whipple, *How to Study Effectively.* Entire book.

PART II

ENDOWMENT OF THE INDIVIDUAL

CHAPTER IV

INDIVIDUAL DIFFERENCES

General Consideration.—One of the most important lessons of modern psychology is that no two human beings are alike. They differ in size, health, knowledge, wealth, race, social position, and innumerable other characteristics. The differences are due to heredity, environment, training, or individual effort. But whatever the causes of the differences, the fact of diversity forms one of the teacher's most pressing and constant problems.

It is not surprising that there are individual differences among human beings. All through the organic world there are great differences among individuals of the same species. In the plant world, for example, it would be impossible to find two leaves, two blades of grass, or two plants exactly alike. Some slight differences, often microscopic, serve to give them individuality.

Doctor Gesell, of Yale University, writes:

Take an ordinary kindergarten and first grade, with a combined enrolment of one hundred pupils, and among this number we may expect to find at least one child feeble-minded; one child who stutters; two or three who seriously lisp; another extremely anæmic; a badly spoilt child; another babyish—a year or two retarded in mental or moral growth; and still another morally weak. There will be one "negative" child—passive, colorless; one oversensitive, nervous child; one superficially precocious child; another distinctly super—eager, ardent, imaginative, sociable. The diversity of the ungraded class membership is often pathetically picturesque. Here is the roll-call for one such class in a large Eastern city: Twenty-four boys, sixteen girls; nationalities Norwegian, French, Irish, Armenian, Italian, Austrian, American, Chinese; names range from James Moriarity and Ong Yung to Arcangelo Christiano and Nishan Kalehadoarian; ages range from 6 to 18; mentality, from giggling imbecility to ambitious intelligence; morality, from truancy, cigarette smoking, and thieving to good behavior; parentage, noted in special cases, includes a drunken mother,

an insane father, and in three instances gypsies; physical condition, from partial blindness and deafness, and spinal trouble and anæmia to vigorous physical health. Think of the problem before this teacher, who may not even have a working definition of feeble-mindedness in her consciousness to aid her in classification and instruction!

It is not difficult to discover abundant cases of individual variations. There are the giants and dwarfs, the tall and the short, the blondes and brunettes; the beautiful and ugly, black and white, good and bad, choleric and phlegmatic, brilliant and stupid, blue-eyed and brown-eyed, and other extremes too numerous to chronicle. Between these extremes there are all grades and shades of apparent difference. Besides these obvious differences there are innumerable variations which are not so apparent and hence thought not to exist. Some persons burst forth into song with the most meagre training, while others, with the best masters, can never carry a tune or discover discord; some are ready spellers, while many others are hopeless; some are born mathematicians, while others never can progress beyond the merest rudiments. One child early exhibits mechanical genius, devising appliances for every sort of work, while another can never learn to put together the simplest contrivance; one can memorize verbatim with the greatest ease, while another can never repeat a quotation; one person picks up the pen and, without training, begins to produce literature, while another cannot chronicle accurately the simplest event; one mounts the platform and charms the multitude with his eloquence, while another is made mute in the presence of an audience. Although all human beings possess the same general faculties, there are wonderful differences of development among individuals and also between the lowest and the highest as a class. Even zoologically there are notable developmental differences. Fiske remarks (*Destiny of Man*, p. 48) that:

> The cranial capacity of the European exceeds that of the Australian by forty cubic inches, or nearly four times as much as that by which the Australian exceeds the gorilla; and the expansion is almost entirely in the upper and anterior portions.

Mental Variations.—There are few who would not admit that among people there are many obvious differences of physical structure, and that these differences are natural. But when mental qualities are considered, it is at once assumed that all are alike, or would be if educated alike. Teachers even are apt to think that all the intellectual differences among children can be accounted for by differences of diligence, willingness to work, or application. They will even admit that temperamental differences account for differences of application, but tacitly assume that intellectually "all men are created equal." No greater fallacy ever existed. No two individuals were ever exactly alike, physically, mentally, or morally. Occasionally a pair of twins seem almost indistinguishable, but careful study of them always reveals large differences.

The mental processes of different individuals have their special characteristics, although this is scarcely suspected by the popular mind. Some are ear-minded, some eye-minded, others motor-minded. Some persons think in abstract terms very early, while others never get to the point of doing abstract thinking, but must have everything in the concrete. Darwin tells us that he does not believe he ever would have made a mathematician or a lawyer, because he found it difficult to carry on a long train of abstractions. He had a marvellous mind for the concrete. Some pupils succeed famously with arithmetic and algebra, but fail utterly in geometry. A diagnosis of their types of imagery would doubtless reveal inability to visualize. Such persons would never make architects or inventors. Some children begin to walk at six or seven months, others not until three times that age. Some can talk readily at twelve months, while I have known a bright boy to defer this process until four years of age. One record chronicles a list of 1,200 words at two years of age. Many do very little talking before two years. There are adult manual laborers of ordinary intelligence who do not have a usable vocabulary exceeding 2,000 or 3,000 words. Many scholars use from 30,000 to 35,000 and recognize as many more.

INTELLIGENCE SCORES MADE BY HIGH-SCHOOL PUPILS ON ARMY ALPHA TESTS*

Alpha Score	Freshmen		Sophomores		Juniors		Seniors	
	Number making the score	Per cent making the score	Number making the score	Per cent making the score	Number making the score	Per cent making the score	Number making the score	Per cent making the score
205								
200	....	....	....	....	....	....	1	0.13
195	....	....	....	....	....	....	0	
190	....	....	....	....	....	....	2	0.26
185	....	....	....	....	2	0.20	0	
180	3	0.17	2	0.16	4	0.41	4	0.52
175	0	....	1	0.08	7	0.72	6	0.78
170	2	0.12	6	0.48	11	1.13	14	1.83
165	3	0.17	9	0.79	18	1.84	18	2.35
160	7	0.41	9	0.79	16	1.64	21	2.74
155	7	0.41	17	1.36	39	3.99	38	4.96
150	12	0.70	22	1.76	42	4.30	33	4.30
145	16	0.93	39	3.11	41	4.20	41	5.35
140	20	1.16	51	4.07	61	6.24	60	7.83
135	40	2.32	38	3.03	68	6.96	47	6.13
130	58	3.37	75	5.90	68	6.96	50	6.52
125	80	4.65	82	6.54	76	7.78	67	8.75
120	80	4.65	91	7.26	84	8.60	60	7.83
115	94	5.46	93	7.42	92	9.41	61	7.96
110	95	5.52	110	8.78	79	8.09	60	7.83
105	120	6.97	93	7.42	60	6.14	51	6.66
100	113	6.57	100	7.98	58	5.94	42	5.48
95	157	9.13	85	6.78	53	5.42	22	2.87
90	130	7.55	95	7.58	29	2.97	20	2.61
85	156	9.07	68	5.42	25	2.56	9	1.17
80	119	6.92	47	3.75	17	1.74	8	1.04
75	109	6.34	44	3.51	11	1.13	20	2.61
70	99	5.75	28	2.23	6	0.61	4	0.52
65	71	4.13	21	1.68	4	0.41	4	0.52
60	50	2.90	13	1.04	2	0.20	1	0.13
55	29	1.68	5	0.40	3	0.31	2	0.26
50	28	1.63	5	0.40	0			
45	14	0.81	2	0.16	1	0.10		
40	1	0.06	0	....				
35	6	0.35	1	0.08				
30	0	....	0					
25	2	0.12	0					
20			0					
15			1	0.08				
10								
No. of cases	1,721	....	1,253	....	977	....	766	
Median	96.48	....	110.84	....	122.89	....	126.42	
Median mental age	15–3		16–2	....	17–0	....	17–4	

* Cobb, Margaret V., "The Limits Set to Educational Achievement by Limited Intelligence," *The Journal of Educational Psychology*, vol. XIII. November, 1922.

Recent "intelligence tests" given to large groups have revealed in an unmistakable way enormous variations in ability in given classes. These were first made definitely manifest in the army examinations. The same and similar tests have been given to school pupils in large numbers. Miss Cobb gathered the results of tests given to 4,717 high-school pupils in Wisconsin, Michigan, Iowa, and Illinois. The accompanying table is made from these results. The test given was the "Army Alpha." The table shows the intelligence scores of the pupils for each of the four high-school years. The highest score possible is 212 points. The highest score made by a freshman was 180 points, three pupils, or 7 per cent of all freshmen, making that score. The lowest score made by any was 15 points, that being made by one sophomore. The highest score made by any pupil was 200 points, made by one senior. The rest of the scores are quite uniformly distributed between the extremes mentioned.

Another exhaustive study was made by Doctor Book (*The Intelligence of High School Seniors*, pp. 10, 21), of the University of Indiana, in a state-wide survey of the intelligence of high-school seniors in Indiana:

This mental examination consisted of ten separate tests of twenty items each: for (1) rote memory, (2) logical selection, (3) general arithmetical ability, (4) opposites, (5) logical memory, (6) word completion, (7) moral classification, (8) dissected sentences, (9) practical information, and (10) analogies. This scale had been previously verified both as to its reliability for the measurement of intelligence and its validity as a practical instrument for making such a mental survey as is proposed in the present study. Previous to this investigation it had been used in a survey of the school population of an entire Indiana county, and had been given to all grade and high-school pupils in three Indiana cities. Earlier still it had been tried out with more than 25,000 high-school and grade pupils in Indiana, Illinois, Colorado, Dakota, and New York.

The accompanying table, based upon that study, indicates the wide variation of intelligence scores among high-school seniors. Doctor Book says: "As may be seen from

an inspection of this distribution curve, the range in score extends farther *below* than *above* the median."

PERCENTAGE OF HIGH-SCHOOL SENIORS POSSESSING EACH GRADE OF INTELLIGENCE

Intelligence grades..	A+	A	B	C+	C	C−	D	E	E−	F
Per cent of total group who made each grade on tests	2	6	14	22	11	19	13	7	5	1

Variations in Achievements.—In a set of examination papers in a large high school there is always exhibited a great range of attainments. If the highest is marked 100 per cent, the lowest doubtless will be less than 60 per cent, and often not higher than 25 per cent. Often there will be pupils who merit more than 100 per cent, that is, they surpass considerably any excellence which we may rightfully expect. In marking a set of papers of average difficulty, some individual papers ought to be above 100 per cent. The marks of 100 per cent, or *A*, or Excellent, ought to mean not absolute marks, but that point in our scale which represents the best that may be expected on the basis of standards determined for the given grade of pupils or kind of work. For example, a first-grade pupil might be marked 100 per cent in penmanship, but an eighth-grade pupil doing the same kind of crude writing ought to be marked about 25 per cent. In large classes several will accomplish more than 100 per cent, the maximum required, by outside reading, by more vigorous thinking, and because of natural capacities.

Thorndike says (*The Principles of Teaching*, p. 71):

The amount of difference actually found in children of the same age or in children in the same school grade is greater than teachers perhaps realize. The range of ability in school children of the same age is such that in a majority of capacities the most gifted child will, in comparison with the least gifted child of the same age, do over six times as much in the same time or do the same amount with less than a sixth as many errors. . . . If the best speller of the class can spell correctly such words as fatiguing, appreciate, delicious, guarantee, triumph, and

accident, the worst speller will barely spell such words as house, dollar, potato, present, severe, and praise.

Thorndike appends the examination papers of two pupils of the same class. *A* spelled correctly all except one word out of twenty, while *B* missed all except one.

If the weakest pupil of a class in computation can do five examples in ten minutes, the best pupil will probably do at least twenty. Roughly speaking, the teacher of a class, even in a school graded as closely as is possible in large cities where two classes are provided in each building for each grade and where promotion occurs every six months, will find in the case of any kind of work some pupil who can do from two to five times as much in the same time or do the same amount from two to five times as well as some other pupil. The highest tenth of her class will in any one trait have an average ability from one and three-fourths to four times that of the lowest tenth.

And we readily see that there must be a constantly varying deviation from normal conditions and averages.

The variations in achievement of pupils in a school is strikingly illustrated in an "age-grade" table. Accompanying is such a table showing the distribution in Grand Rapids, Mich., in 1920. The table may be read as follows: There were in the first grade 55 children 5 years of age, 1,272 children 6 years, 691 were 7 years, 199 were 8 years, etc. Note that there were 12-year-olds and 13-year-olds in ten different grades, and children of 14 and 15 in nine different grades! In the first year of the high school there were 19 who were 12 years old and 2 who were 21 years or over.

Revelations of a School Survey.—On the basis of a recent school survey the following striking variations were discovered:

(1) There is a range of at least six years between the youngest pupil and the oldest pupil in any grade from the first to the eighth, in the second grade the range of ages being greatest—nine years.

(2) In each grade from the first to the eighth the median age is at least one year above the national standard for that grade.

(3) On the basis of a two-year span for each grade (*e. g.*, 6 to 7 for the first grade, 7 to 8 for the second grade, etc.), 40 per cent of all pupils in grades one to eight are older than they should be for the grades in which they are located, the lowest percentage being 31 per cent in grade four and the highest percentage being found in grade eight, 54 per cent. In grades six and eight there are actually more pupils over-age than of normal age.

(4) In grades one to eight only a little more than one-half of the pupils are of normal age for the grades in which they are located.

(5) In the first grade are found pupils of ages all the way from 6 to 12; in the second grade from 7 to 16; in the sixth grade from 9½ to 18.

(6) Pupils 12 years of age are found in every grade from the first to the eighth, and in general pupils of any year-age from 8 to 16 are scattered over at least five grades of the schools. (From *Psychological and Educational Tests in Public Schools of Winchester, Va.*, January, 1922.)

Causes of Individual Differences.—The individual differences in any given group are always due to many causes. In the first place there are the sex differences. Boys and girls are different in many physical characteristics. Through life their bodies become increasingly different in size and proportions, as well as in various entirely different structural conditions. Girls mature physically a year or two earlier than boys, and there is a similar difference in mental maturity. While quantitative measurements of such intellectual powers as perception, memory, or reasoning do not reveal marked differences, undoubtedly the mental lives as a whole of the sexes are very different. This is especially true of the emotional aspects. Differences do not mean superiority or inferiority, simply differences. Psychology and literature have always recognized these differences.

There are also race and family traits of heredity which differentiate individuals. These hereditary differences may be either physical or mental. There are the giants and the dwarfs

AGES AND GRADES OF PUPILS
Base Date September 1, 1920

Grades	TOTALS																		Totals
	Ages																		
	Under 5	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21 or over	
Kgn.	184	1,552	505	43	2	2													2,288
I		55	1,272	691	199	35	2	1	1	1									2,257
II			65	852	599	223	51	9	2	1		1							1,803
III			3	128	755	581	206	50	16	1									1,740
IV				7	189	682	512	220	96	21	6		1						1,734
V					5	123	605	417	222	83	21	3							1,479
VI						10	170	584	460	222	83	34	5						1,568
VII							9	146	539	494	262	82	22	3		1			1,558
VIII								12	170	568	404	219	76	8					1,457
IX									19	231	608	469	207	44	11	1	1	2	1,593
X									1	8	121	388	277	129	37	19	3	5	988
XI											12	136	319	213	62	20	10	10	782
XII											1	21	87	209	157	58	15	11	559
Totals	184	1,607	1,845	1,721	1,749	1,656	1,555	1,439	1,526	1,630	1,518	1,353	994	606	267	99	29	28	19,806

Taken from Board of Education, Grand Rapids, Mich., 1921, *Forty-ninth Annual Report*, p. 52.

physically of all ages. There are likewise the brilliant and the idiotic, with all gradations between. The exact measurement of the intelligence of school children in recent years has emphasized these mental variations.

CAUSES OF NON-PROMOTIONS AND NUMBER OF EACH

1920–1921		
1.	Irregular attendance	190
2.	Ill health	165
3.	Mental incapacity	579
4.	Lack of application	267
5.	Lack of concentration	148
6.	Inattention	65
7.	Change of school	81
8.	Immaturity	236
9.	Unfavorable home conditions	17
10.	Physical defects (eye, ear, nose, throat)	56
11.	Foreign to English	45
12.	Unwise previous promotion	41
13.	Unskilful previous teaching	4
14.	Unskilful current teaching	1
15.	Not properly graded	50
16.	No knowledge of how to study	7
17.	Lack of nourishing food	4
18.	Too many pupils in a class	2
19.	Outside social activities	1
20.	Rapid physical growth	4
21.	Entering late in semester	81
22.	Discouragement, owing to lack of co-operation at home	None
23.	Adolescence	3
24.	Special mental type for which course of study is not adapted	23
25.	Lack of interest in the work	15
	Total	2,085

Taken from Board of Education, Grand Rapids, Mich., 1921, *Forty-ninth Annual Report*, p. 61.

Differences in achievements as well as differences of capacity must be taken into account in all scientific school adjustment. These differences are quite as apt to be due to environing conditions as to native endowment. Many pupils in the schools have undesirable home conditions under which to do their work. Probably few have a room properly heated, ventilated, and lighted, adequate desk room or freedom from

disturbance. Many are under special emotional tension because of straitened pecuniary circumstances, sorrow in the family, ill treatment, premature love-affairs, undue social life, real or imagined ill health, and a great variety of other causes. All of these factors affect the working capacity of the pupil and materially influence the amount and quality of work accomplished. The wise teacher will recognize that there are influences constantly operative in affecting results. Before passing judgment, causes and motives will be investigated. Fewer cases will be measured by inflexible rules, and more and more will individual cases be evaluated on their merits.

Various studies have been made to diagnose the causes of variations among the pupils in given schools. The results of such a study are indicated in the accompanying table, taken from a recent Grand Rapids school report.

Adolescent Variations.—While differences in powers and interests manifest themselves from the beginnings of life, they are not so pronounced up to the age of 12 to 14 as they become from that time on. During the period in the elementary-school grades the work for all may be fairly uniform in content. Up to that time vocational interests have not been very prominent. With the onset of adolescence, however, the racial, family, and sex differences begin to manifest themselves more strongly than before. The occupational interests also begin to be prominent, probably largely due to social environment. Because of all these conditions much more definite recognition of individual differences and needs should be accorded. To assist in this process the junior high school has been established in many places.

How Discover Individual Differences ?—Even very ordinary everyday observation on the part of the teacher will serve to discover many obvious differences among pupils. It will be noted that some are keen, alert, and attentive, while others are slow, plodding, and allow their attention to wander easily. Differences in the amount of general information and in the accuracy of information are quite easily apparent to the general observer. Slipshod speech, including incorrect

sentential structure, faulty pronunciation, and indistinct enunciation are easily detected and generally suggestive of inaccurate knowledge and low-grade scholarship. Defective eyesight and hearing are also generally easily noted.

The examinations and tests given pupils in their various studies are the most usual means of discovering differences. The great variations in examination papers noted elsewhere reveal these differences in a striking and often most unexpected degree. If examinations are carefully arranged so as to take account of time and conditions of preparation, conditions in the manner of the examination itself, and types of learning, they are very valuable in diagnosis. The daily oral tests are also suggestive in discovering other types of differences. In addition to the usual tests in subject-matter, other tests have been recently devised to test mental ability as distinguished from information. These tests are discussed under "Measuring Mental Ability."

Ministration to Individual Differences.—When we have studied the pupils and discovered individual differences either in native ability or in achievement, what should be done? Certainly we should minister to the needs of all to the best possible advantage. The following are a few of the ways in which rather easy adjustment can be made.

All pupils should not be expected to carry the same amount of work. Even though they were all of equal ability, the conditions under which they work and have worked are so different that the accomplishments will vary greatly. One boy in a given class may come from a good home where he is provided with a properly heated, lighted, and ventilated room. He may have access to a good library of books, have parents who are intelligent and interested in his work, and who give him proper stimulus and encouragement. We should expect such a boy to have his work prepared. Another boy in the same class may come from a home of poverty; he has no room to himself, his studying must be done, if at all, around the kitchen table where all the family are gathered. He may have to get up at four o'clock in the morning to carry papers in

order to be one of the wage-earners for family maintenance. His parents may lack schooling or even sympathy with education and with his work. May we rightly expect adequate results from such a boy?

Doubtless the majority of pupils in a given grade can do the regular amount of work in that grade in a given year. Some, however, can do from a quarter to a third more than the average, and should be given an opportunity to do so. If they take only the same amount as the average pupils, they will waste much valuable time. Others, from lack of ability or because of unfavorable conditions, cannot do nearly as much as the average pupils. They should be allowed to go as slow as necessary. No stigma should be placed upon them for their slower pace. It is entirely possible that they may outstrip their fellows at a later time.

Again we should not expect the same standards of quality of all. The uses to which knowledge is to be put should often allow of varying standards of proficiency. To illustrate, a boy who is certain to go to an engineering school should be held for more mathematics and for a more exacting quality in it than a boy or girl who is certain to have little need for it in their later studies or in everyday life.

Apart from the knowledge of the fundamentals of reading and writing, the exact knowledge needed in later study or in business is exceedingly variable for different individuals. Should it transpire that a given person may need more knowledge of a given subject for purpose of higher study or for business uses, the particular knowledge can be acquired quickly at the time needed, if the individual has adequate ability.

The school should give opportunities not only for dull and delinquent children, but equally for precocious and earnest ones. Not only are there many subnormal children in every school, but there are many hypernormal—those with potential qualities which only await development to make them the illustrious of their time. As a matter of fact, undue proportions of energy and time are given to the lame and the lazy.

Much solicitude is given to finding ways and means of helping the slow, while little thought is given to special ways of providing for those who can easily forge ahead. It is usually the slow pupil who is given most of the time in recitation (except when visitors are present); the slow one who is kept after school to be helped; the slow one over whose papers the teacher burns the midnight oil. The bright one recites quickly, asks few time-consuming questions, easily finds occupation for himself, is seldom selected for extra work, and is a joy forever to his teacher. But how frequently he becomes restive because of the lock-step which he must keep, the time consumed with the slower, and the consequent narrowing of instruction. The result is that frequently such pupils become dissatisfied—they know not why—and either make a dash for liberty, become chronic sources of annoyance, or learn to meekly submit and become dawdlers. Doctor Search has shown (*An Ideal School*, p. 21) that children often drop behind a grade, but seldom skip one.

The opportunity to get ahead is almost always limited by class environment. Between these two kinds of opportunity there is an abysmal difference. As schools usually go, it is ten times harder for a pupil to gain a grade than to lose one; ten times harder to rise than to fall. Never until the school is built fundamentally for the individual will this element of loss disappear.

Doctor Groszmann urges that public attention be directed to all types of exceptional children, not merely to the feebleminded and degenerate, who, no matter how undesirable a factor they may be in society, are by no means the whole problem. He points out that the problem of the exceptional child is by no means merely the problem of the defective, or the subnormal, or the abnormal child. Often it is a case of misdirected ability on the part of a gifted mind; or the problem of child growth and development as affecting criminal tendencies. Sometimes it is vocational failure, due to improper vocational education; or it may be a problem arising from racial differences, together with the difficulties of social adjustment in a nation which has grown through immigration.

Doctor Whipple demonstrated through a very carefully conducted experiment that it is possible to select pupils from the grades who are able to do two years' work in one year. He maintains that the especially gifted who might attempt a double rate of progress should be selected through expert mental tests rather than through the examination grades or through the general estimates of teachers or superintendents. Classes for especially highly gifted are not maintained in many places. It is often reported that they are, but Whipple found on close investigation of scores of cities reported to be maintaining them that not one really had one. He found "that one of them only occasionally promoted individual pupils; one had a room for dull but never for bright children; one had a 'mixed' room for both dull and gifted (!); and two gave individual coaching to pupils who were trying for special promotions." (*Classes for Gifted Children*, p. 114.)

Courtis says that "the supreme thing in education is the fact of the very great variation in the abilities and needs of individuals. It is true that the writer urges the necessity for the measurement of . . . the entire school, but it is also true that in no other way will the facts of individual variation and of present gross inefficiency be revealed. . . . At the present time the school is able to teach only those fitted by nature to respond readily to its teaching, but if it were organized to detect and minister to the special need of the individual, vastly more could be accomplished. Definite aims, *i. e.*, to render every child in the eighth grade able by June to add in four minutes thirty-five examples, each a single column of nine figures—and diagnostic tests—*i. e.*, tests that will enable a teacher to determine exactly why a child can work but twenty-three such examples in the time allowed—and the experimental determination of efficient methods, are the lines along which progress will be made. The basic factor in education is thus the fact of individual differences in natural ability, and the supreme problem of the future is the working out of administrative methods of dealing with large masses of children, yet at the same time giving to each child the special

attention and the special courses it needs, without sacrificing the benefits of class work and group instruction." (Courtis, S. A., "The Reliability of Single Measurements with Standard Tests," *Elem. Sch. Teacher*, 13, pp. 486–504.)

Burbank, the botanical wizard, considers differentiation as absolutely necessary and unavoidable. He says ("The Training of the Human Plant," *Century*, 72, pp. 127–138):

Right here let me lay special stress upon the absurdity, not to call it by a harsher term, of running children through the same mill in a lot, with absolutely no real reference to their individuality. No two children are alike. You cannot expect them to develop alike. They are different in temperament, in tastes, in disposition, in capabilities, and yet we take them in this precious early age, when they ought to be living a life of preparation near to the heart of nature, and we stuff them, cram them, and overwork them until their poor little brains are crowded up to and beyond the danger-line. The work of breaking down the nervous systems of the children of the United States is now well under way. . . . It is imperative that we consider individuality in children in their training precisely as we do in cultivating plants. Some children, for example, are absolutely unfit by nature and temperament for carrying on certain studies. Take certain young girls, for example, bright in many ways, but unfitted by nature and bent, at this early age at least, for the study of arithmetic. Very early—before the age of ten, in fact—they are packed into a room along with from thirty to fifty others and compelled to study a branch which, at best, they should not undertake until they have reached maturer years. Can one by any possible cultivation and selection and crossing compel figs to grow on thistles or apples on a banana-tree?

School Promotions.—In the primary grades a large portion of the time should be devoted to studying the exact status of each individual in the class. In every group of forty first-grade pupils entering in September there are ordinarily 10 per cent who do not need to remain in that grade a month. Another 25 per cent could be promoted or at least should be separated from the rest by the middle of the year. Another group will need special attention and will not be ready to go on even at the end of the year. But how often the September consignment is bunched together, once for all, labelled, put through the same process, pressed, pushed, pulled, ground,

and stretched, until they appear uniform, and are ready to be ticketed and passed on to the next grade or department. Thus they stay together except as death or disgust separates them. No fact of modern psychology is more important than that there are countless individual differences which must be recognized in all good teaching. These differences must be sought and individuals ministered to accordingly.

If individual differences are to be adequately recognized, the plan of promotion must be flexible. The annual promotion does not provide a sufficient frequency of opportunity for reclassification. This is especially true if pupils are promoted only when they pass in all of the subjects of the grade. There should be at least semiannual occasions for the redistribution of pupils. If the quarter plan of organization should come into vogue in the public schools as it has in a good many universities, it would afford desirable opportunities for needed readjustments.

In addition to the periodical opportunities for promotions, it should always be possible to promote a given pupil at any time when it is discovered that the pupil could profit by being moved ahead. It should not be necessary for a pupil to pass in all subjects in order to be promoted in a given subject. He should be allowed to move ahead in any subject as fast as possible or as slowly as necessary. The subject unit system instead of the entire grade should prevail. Of course it may be inconvenient sometimes to promote a pupil in a single subject only because of administrative difficulties. But what if the school machinery does squeak? The school should fit the needs of the child and not the child the school.

Differentiation of Curricula.—We no longer require all pupils to take the same curriculum. In the high school some take the classical course, some the modern-language course, some the scientific course, some a business course, some a manual-arts course, and some the domestic-science course. Even within these courses there are many variations so that all sorts of individual differences can be recognized and ministered to. Then there are schools for the blind, the deaf

and dumb, for cripples and for feeble-minded. Ideally the curriculum for a given pupil becomes a question of individual adjustment for that particular pupil. Pupils cannot be successfully educated if they are all treated alike in the mass. Each one must be singled out, studied, and then educated according to his particular capacities and needs.

University education is a much more complex problem than it used to be. Formerly all in a given college took the same course, *the* course. Now there are colleges within the university and schools within the colleges. There are not only opportunities to differentiate so one may study law, medicine, engineering, forestry, journalism, fine arts, teaching, agriculture, or mining, but there are manifold special lines within each. For example, there are criminal law and corporation law, electrical and chemical engineering, horticulture and stock-breeding in agriculture, painting and music in fine arts, high-school teaching and kindergarten work in teaching. When the particular line is selected, even then there are manifold paths for attaining successful goals in the given field.

Dewey says (*Schools of Tomorrow*, p. 137):

A truly scientific education can never develop so long as children are treated in the lump, merely as a class. Each child has a strong individuality, and any science must take stock of all the facts in its material. Every pupil must have a chance to show what he truly is, so that the teacher can find out what he needs to make him a complete human being. Only as a teacher becomes acquainted with each one of her pupils can she hope to understand childhood, and it is only as she understands it that she can hope to evolve any scheme of education which shall approach either the scientific or the artistic standard. As long as educators do not know their individual facts, they can never know whether their hypotheses are of value. But how are they to know their material if they impose themselves upon it to such an extent that each portion is made to act just like every other portion? If the pupils are marched into line, information presented to them which they are then expected to give back in uniform fashion, nothing will ever be found out about any of them. But if every pupil has an opportunity to express himself, to show what are his particular qualities, the teacher will have material on which to base her plans of instruction.

Since a child lives in a social world, where even the simplest act or

word is bound up with the words and acts of his neighbors, there is no danger that this liberty will sacrifice the interest of others to caprice. Liberty does not mean the removal of the checks which nature and man impose on the life of every individual in the community, so that one individual may indulge impulses which go against his own welfare as a member of society. But liberty for the child is the chance to test all impulses and tendencies on the world of things and people in which he finds himself, sufficiently to discover their character so that he may get rid of those which are harmful, and develop those which are useful to himself and others. Education which treats all children as if their impulses were those of the average of an adult society (whose weaknesses and failures are moreover constantly deplored) is sure to go on reproducing that same average society without even finding out whether and how it might be better. Education which finds out what children really are may be able to shape itself by this knowledge, so that the best can be kept and the bad eliminated. Meantime much is lost by a mere external suppression of the bad which equally prevents the expression of the better.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Compare in age, height, and weight the different children in a first grade. 2. Compare in the same characteristics the seniors in a high school. 3. Compare the interests of a group of first-grade pupils. 4. Compare the range of grades given in some class in high school. 5. Have a set of examination papers marked by several teachers. Note the variations in the grades assigned. 6. Call to mind some pupil who is strong in certain subjects but weak in others. 7. If a pupil is strong in one subject, what probability is there that he will be strong in others? 8. Should all pupils pursue the same course of study? 9. What special schools are there in your state to care for the various special classes of children? 10. Are pupils more apt to skip grades or to repeat them? 11. What is an "opportunity school"? 12. If certain pupils are sure to know their lessons, what should they do while others are reciting? 13. What work could be omitted safely in arithmetic for the least-gifted pupils? 14. To what extent should electives be allowed in (*a*) the grammar-school, (*b*) the high school, (*c*) in an engineering college? 15. Should specially gifted children be educated in separate schools?

References for Further Reading

1. Bolton, *Principles of Education*, chap. XII.
2. Cameron, *Psychology and the School*, chap. XIV.
3. Judd, *Introduction to the Scientific Study of Education*, chap. XII.
4. Meriam, *Child Life and the Curriculum*, chap. X.
5. Starch, *Educational Psychology*, chaps. III, IV, V.

6. Terman, *The Intelligence of School Children*, chaps. III, IV, V, VI.
7. Thorndike, *Principles of Teaching*, chap. VI.
8. Thorndike, *Individuality*. Entire book.
9. Strong, *Introductory Psychology for Teachers*, lesson 24.

CHAPTER V

NATIVE ENDOWMENT: HEREDITY

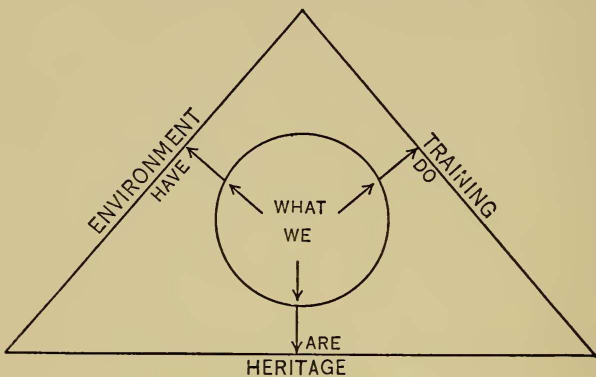
All have heard the metaphor comparing the child to a piece of clay in the potter's hands to be moulded at the will of the teacher. Sometimes the figure is changed, and the child is compared to a block of marble and the teacher to the artist who is to chisel out whatever likeness he may conceive. Now, in reality are either of these comparisons psychologically true? Is the child a piece of inert material that can be moulded or chiselled as we will? Suppose we should decide that the blond child should be brunette, that the short child should be tall, or that the feeble-minded should be normal. Could we effect these changes regardless of the inner powers and potentialities of the real child? There are enthusiasts who seem to believe that the modifications which environment may produce are practically unlimited. But, when such questions as the foregoing are raised, such claims at once appear absurd. It is recognized at once that there are norms toward which each one develops simply because of inner tendencies struggling to assert themselves. This is not to minimize the influence of environment, but to show some of its limitations. Education is in part a process of unfoldment or development of the native powers, capacities, and potentialities of a child. In order to understand just what these inner forces mean and what power they possess, it will be desirable to study something of the subjects of heredity and instinct.

Thorndike says ("Eugenics, with Special Reference to Intellect and Character," *Pop. Sci. Mo.*, 83, pp. 125–138, August, 1913):

Long before a child begins his schooling, or a man his work at trade or profession, or a woman her management of a home—long indeed before they are born—their superiority or inferiority to others of the

same environmental advantages is determined by the constitution of the germs and ova whence they spring, and which, at the start of their individual lives, they *are*.

All will agree that what any individual becomes depends (1) upon his initial endowment, and (2) upon the use that is made



THE TRIANGLE OF LIFE

of these powers or potentialities. This last depends to a considerable extent upon the environment by which the individual is surrounded.

Doctor Walter has stated the matter very aptly by saying (*Genetics: An Introduction to the Study of Heredity*, p. 13):

> Three factors determine the characteristics of an individual, namely, *environment*, *training*, and *heritage*, as expressed diagrammatically in Fig. 1. It may indeed be said that an individual is the result of the interaction of these three factors, since he may be modified by changing any one of them. Although no one factor can possibly be omitted, the student of genetics places the emphasis upon heritage as the factor of greatest importance. Heritage, or "blood," expresses the innate equipment of the individual. It is what he actually *is* even before birth. It is his nature. It is what determines whether he shall be a beast or a man. Consequently in the diagram above the triangle of life is represented as resting solidly upon the side marked "heritage" for its foundation.

"Environment and training, although indispensable, are both factors which are subsequent and secondary. Environ-

ment is what the individual *has*, for example, housing, food, friends, and enemies, surrounding aids which may help him and obstacles which he must overcome. It is the particular world into which he comes, the measure of opportunity given to his particular heritage.

"Training, or education, on the other hand, represents what the individual *does* with his heritage and environment. Lacking a suitable environment, a good heritage may come to naught, like good seed sown upon stony ground, but it is nevertheless true that the best environment cannot make up for defective heritage or develop wheat from tares.

"The absence of sufficient training or exercise even when the environment is suitable and the endowment . . . is ample will result in an individual who falls short of his possibilities, while no amount of education can develop a man out of the heritage of a beast. Consequently the biologist holds that, although what an individual *has* and *does* is unquestionably of great importance, particularly to the individual himself, what he *is* is far more important in the long run. Improved environment and education may better the generation already born. Improved blood will better every generation to come."

Meaning of Heredity.—It is a law of nature that the descendants of individuals tend to be like their ancestors. Every one knows that children are apt to look like their parents or near relatives, to have similar dispositions, and to have many characteristics common to the family group. This law of transmission and reproduction of ancestral traits in descendants is termed heredity. President David Starr Jordan says (*Animal Life*, p. 88):

There is something inherent in each developing animal that gives it an identity of its own. Although in its young stages it may be indistinguishable from some other kind of animal in similar stages, it is sure to come out, when fully developed, an individual of the same kind as its parents were or are. The young fish and the young salamander . . . are indistinguishably alike, but one embryo is sure to develop into a fish and the other into a salamander. This certainty of an embryo to become an individual of a certain kind is called the law of heredity.

This is the great conservative force in nature. Through heredity evolution is made possible, since variations once established tend to be transmitted to posterity.

Physical Heredity.—Heredity of physical structure is everywhere apparent among human beings. It may manifest itself in stature, weight, length of limbs, color of eyes or hair, facial features, or expression. Children are often said to be exact images of father, mother, or grandparents. Among animals resemblances of young to parents are equally striking. The same laws are observable in plants. It may be safely predicted that a grain of corn or any other plant seed will produce under ordinary conditions a new plant of the same kind and of similar size, form, and color as that which bore the seed. The facts are all too obvious to need more than suggestion. Internal structures as well as external are governed by the laws of heredity. The various proportions of the cranium, thorax, vertebræ, teeth, the peculiarities of the circulatory system and the nervous system, which are manifest in a given individual, will probably be found upon investigation to be characteristics common to his ancestry and his posterity. Ribot tells us that "there are some families in which the heart and principal blood-vessels are naturally very large; others which present identical faults of conformation." The nervous system, especially the brain, seems to follow a certain type in a given family or "line of ascent." Length of natural life is doubtless an ancestral bequest. In a family where there is a centenarian there is almost sure to be a number who live to a very old age, exceeding their allotted "threescore and ten." Ribot writes that "longevity depends far less on race, climate, profession, mode of life, or food than on hereditary transmission." (Ribot, *Heredity*, pp. 3 and 5.)

Thomson says that "not less striking than the long persistence of specific and stock characters is the fact that offspring frequently reproduce the individual peculiarities—both normal and abnormal—of their parents or ancestors. A slight structural peculiarity, such as a lock of white hair or an extra digit, may persist for several generations. A slight

functional peculiarity, such as left-handedness, has been recorded for at least four generations, and color-blindness for five." (J. Arthur Thomson, *Heredity*, p. 70.)

Conklin says ("Phenomena of Inheritance," *Popular Science Monthly*, October, 1914, p. 314):

> All peculiarities which are characteristic of a race, species, genus, order, class, and phylum are of course inherited, otherwise there would be no constant characteristics of these groups and no possibility of classifying organisms. The chief characters of every living thing are unalterably fixed by heredity. Men do not gather grapes of thorns nor figs of thistles. Every living thing produces offspring after its own kind. Men, horses, cattle; birds, reptiles, fishes; insects, mollusks, worms; polyps, sponges, micro-organisms—all of the million known species of animals and plants differ from one another because of inherited peculiarities—because they have come from different kinds of germ-cells.

Mental Heredity.—Ribot makes an interesting and exhaustive study of the heredity of various psychological powers, including memory, imagination, the will, instinct, the sentiments and passions. He shows that memory is indeed merely a disposition of nervous tissue on the one hand, and of the mind on the other, to act again in a way in which they once have acted. Memory is a dynamic relation existing among various types of dynamic possibilities. A given type, he believes, is apt to be characteristic of the various members of a family. He mentions several cases to support his view:

> The two Senecas were famed for their memory . . . Marcus Annæus could repeat 2,000 words in the order in which he heard them; the son, Lucius Annæus, was also, though less highly, gifted in this respect. According to Galton, in the family of Richard Porson, one of the Englishmen most distinguished as a Greek scholar, this faculty was so extraordinary as to become proverbial—the Porson memory. (Ribot, *Heredity*, p. 53.)

Families are often renowned for their special types of imagination. Among painters it is not at all uncommon to find several generations of especially gifted artists. In the family of Titian were nine painters of great merit. Cagliari

had several relatives who were nearly as illustrious as himself. A catalogue of names of painters who have belonged to families celebrated for their artistic genius must contain such names as Rafaël, Van Dyck, Murillo, and Claude Lorrain. Ribot says:

A glance at any history of painting, or a visit to a few museums, will show that families of painters are not rare. In England you have the Landseers; in France the Bonheurs. Every one has heard of the Bellinis, Caraccios, Téniers, Van Ostades, Miéris, Van der Veldes. In a list of forty-two painters—Italian, Spanish, and Flemish—held to be of the highest rank, Galton found twenty-one that had illustrious relatives. (*Ibid.*, p. 60.)

Another type of imagination which can be easily studied for hereditary tendencies is the musical type. Sebastian Bach was the greatest of an extraordinarily gifted family of musicians. The family began in 1550, and was illustrious through at least eight generations. Beginning with Weit Bach, the Presburg baker, we have a record of an "unbroken line of musicians of the same name that for nearly two centuries overran Thuringia, Saxony, and Franconia." In the family there were twenty-nine eminent musicians. The names of Beethoven, Mendelssohn, Mozart, and Haydn all represent families famed for their musical abilities.

Conklin writes (*loc. cit.*) that:

Psychological characters appear to be inherited in the same way that anatomical and physiological traits are; indeed all that has been said regarding the correlation of morphological and physiological characters applies also to psychological ones. No one doubts that particular instincts, aptitudes, and capacities are inherited among both animals and men nor that different races and species differ hereditarily in psychological characteristics. Certain breeds of dogs, such as the mastiff, the bulldog, the terrier, the collie, and many others, are characterized by peculiarities of temperament, affection, intelligence, and disposition. No one who has much studied the subject can doubt that different human races and families show characteristic differences in these same respects. It is quite futile to argue that exceptional individuals may be found in one race with the mental characteristics of another race; the same could be said of different races of dogs, or of the sizes

of different races of beans or of paramecia. The fact is that racial characteristics are not determined by exceptional and extreme individuals but by the average or mean qualities of the race; and measured in this way there is no doubt that certain types of mind and disposition are characteristic of certain families.

Conklin bears further testimony on this point when he says:

There is no longer any question that some kinds of feeble-mindedness, epilepsy, and insanity are inherited, and that there is often a hereditary basis for nervous and phlegmatic temperaments, for emotional, judicial, and calculating dispositions. Nor can it be denied that strength or weakness of will, a tendency to moral obliquity or rectitude, capacity or incapacity for the highest intellectual pursuits, occur frequently in certain families and appear to be inherited. In spite of certain noteworthy exceptions, which may perhaps be due to remarkable variations, statistics collected by Galton show that genius is hereditary; while the work of certain recent investigators, particularly Goddard, Davenport, and Weeks, proves that feeble-mindedness and epilepsy are also inherited; and the careful work of Mott and of Rosanoff leaves no room for doubt that certain types of insanity are hereditary. It frequently happens that families in which hereditary insanity occurs also have other members afflicted with epilepsy, hysteria, alcoholism, etc., which would indicate that the thing inherited is an unstable condition of the nervous system which may take various forms under slightly different conditions. Woods has collected data concerning "Heredity in Royalty" which seem to show that very high or low grades of intellect and virtues may be traced through the royal families of Europe for several generations.

History of the Juke Family.—In 1877 R. Dugdale published in the *Thirtieth Annual Report* of the New York Prison Commission a study of the so-called Juke family. Juke is a name given to a large family of degenerates. It is not the real name of the family, but a general term applied to forty-two different families whose ancestry could be traced to one particular man. The father of the Juke family, Dugdale termed Max. He was of Dutch stock, born about 1720. He was shiftless, played truant, and was a general vagabond. He married a woman as worthless as himself. They reared a family of vagabonds, and these children in due time intermarried with other vagabonds. In 1877, in five generations, there were 540

direct descendants and about 700 of more distant relation; 300 of the 1,200 were professional paupers, 7 were murderers, 60 were habitual thieves, 130 were criminals who were frequently convicted of crime, 300 died in infancy, while 400 were physically degenerate. Only 20 of the 1,200 learned a trade, and 10 of those learned it in a state prison. They had cost the State of New York $1,000 apiece, including all men, women, and children; a total of $1,250,000.

History of Jonathan Edwards's Family.—In 1898 Doctor A. E. Winship, who had made a study of the Jukes, determined to make a study of some desirable family to offset the appalling record of the Jukes. He selected for his study Jonathan Edwards, who was born October 5, 1703. While Max Juke was the founder of a family of 1,200, mostly paupers and criminals, he found that Jonathan Edwards was the founder of a family of 1,400 of the world's noblemen, most of whom have left the world better for having lived in it. It is possible here to cite only a few of the illustrious descendants of Jonathan Edwards. In Yale alone there have been more than 120 graduates who were direct descendants; among these are nearly 20 Dwights, as many by the name of Edwards, 7 Woolseys, 8 Porters, 5 Johnsons, and several of most of the following names: Chapin, Winthrop, Shoemaker, Hadley, Lewis, Mather, Reeve, Rowland, Carmalt, Devereaux, Weston, Heermance, Whitney, Blake, Collier, Scarborough, Yardley, Gilman, Raymond, Wood, Morgan, Bacon, Ward, Foote, Cornelius, Shepard, Bristow, Wickersham, Doubleday, Van Valkenberg, Robbins, Tyler, Miller, Lyman, Pierpont. Mr. Churchill, author of *Richard Carvel*, is a recent graduate. In Amherst there were at one time of this family, President Gates and Professors Mather, Tyler, and Todd. There is not a leading college in the country in which their names are not to be found recorded. They have not only furnished thirteen college presidents and one hundred or more professors, but they have founded many important academies and seminaries in New Haven and Brooklyn, all through the New England States, and in the Middle, Western, and

Southern States. Not only have they furnished scholars, but statesmen, lawyers, financiers, and other men and women of high rank in practically every walk of life. One hundred and thirty-five books of merit have been written by the family, eighteen journals and periodicals of large importance have been edited by them, and several of them founded by members of the family. Several descendants have been among the most illustrious men of their time. Examples of these are President Timothy Dwight, President Theodore Dwight Woolsey, Doctor Theodore W. Dwight, president of Columbia College Law School, and Daniel Coit Gilman. The only notable black sheep in the family was Aaron Burr, Edwards's grandson, and there is no question that he possessed great mental acumen. But for a single unfortunate characteristic and the custom of the time, which allowed this trait to go unchecked, Burr might have been one of the great instead of being numbered among the dishonored. At forty-nine he was one of the most brilliant, most admired, and most beloved men in the United States. For thirty years his career had few American parallels.

Perhaps some one may contend that the foregoing shows the result of environment rather than hereditary tendencies. The rejoinder should be made that the environment in a large way was practically the same for the Juke family as for the Edwards. The periods are synchronous and there was no great difference between New York and Massachusetts. It could have been no chance condition of environment which made nearly all of one family differ from all of the other. If environment were really so potent as many claim, the sameness of environment should have brought the two families as a whole to the same level.

"The Kallikak Family."—Of still greater significance is a more recent study by Goddard, *The Kallikak Family*. Martin "Kallikak" having been married twice and having reared two families with different mothers makes it possible to check more definitely the rôle of heredity and of environment. The family descended from the first wife, a feeble-minded woman,

is a duplicate of the Juke family. The descendants by the second wife, a woman of normal intelligence, included few degenerates or criminals. The majority were respectable citizens, among them doctors, lawyers, judges, educators, and business men.

It is not argued that environment has no effect in determining the ultimate development of individuals. The effects are very consequential. One who disbelieves in them should not remain in the ranks of educators. But there are very definite limits beyond which environment exercises no control. No amount of feeding could make a mastiff of a poodle. No amount of underfeeding could limit the growth of a mastiff to the size of the poodle. Similarly no amount of training could make a Shakespeare of an idiot. Shakespeare, even though untrained, would have been a marked man. We must keep in mind a distinction between great mental power and reputation; between ability and success. Obscurity is not a necessary correlate of weakness. Many intellectual giants have been obscure. A distinction must also be made between biological and social heredity; between intellectual power and the use to which one puts this power. Biological heredity determines largely what mental capacity shall be, but social heredity and environment determine what use shall be made of physical and intellectual powers. Morality is much more influenced by environment than is intellectual strength. Whether one makes locks or picks them depends largely on one's environment, but the capacity to do either is a matter of native endowment.

Hereditary Disease Tendencies.—While specific diseases as such are probably not directly inheritable, it is none the less true that tendencies to disease are very definitely inherited. "The process," says Thomson, "is not transmitted, but the potentiality of it is involved in some peculiarity in the organization of the germ-plasm." The same authority writes that "there are endless illustrations of the fact that a pathological diathesis—rheumatic, gouty, neurotic, or the like—may persist and express itself similarly, even in spite of altered con-

ditions of life, throughout many generations." (*Op. cit.*, p. 70.) While germ diseases are not directly heritable, it should not be supposed for a moment that children of parents afflicted with such diseases as tuberculosis are no more liable to it than are children of parents entirely free from it. In a strict biological sense the disease is not transmitted, but the devitalized constitution giving a predisposition is heritable.

Good and poor eyesight are family characteristics. Congenital blindness sometimes occurs in several generations of the same family. In one family thirty-seven children and grandchildren became blind between their seventeenth and eighteenth years. Of another family, a father and his four children all became blind at the age of 21. "Color-blindness," says Ribot, "is notoriously hereditary. The distinguished English chemist, Dalton, was so affected, as were also two of his brothers. Sedgwick discovered that color-blindness occurs oftener in men than in women." Darwin wrote (*Variation of Plants*, II, p. 70): "Myopia is said to be becoming hereditary among certain civilized nations, especially the Germans." Particular types of hearing are doubtless hereditary. Although the offspring of a deaf-mute and a person of sound hearing are seldom deaf, yet where both parents are mute their children are apt to be deaf or to be afflicted with some kindred disease. In the Deaf and Dumb Institution in London: "Among 148 pupils in the institution at one time, there was one in whose family were 5 deaf-mutes; another in whose family were 4. In the families of 11 of the pupils there were 3 each; and in the families of 19, 2 each." (Ribot, *op. cit.*, p. 42.) "The brothers and sisters of the deaf are deaf in 245 cases in 1,000. The child of deaf parents is 259 times as likely to be deaf as if its parents were normal." (Fay, *Marriage of the Deaf in America*, p. 49.) "Out of 901 admissions to an asylum, 477 had insane relatives; out of 321 cases of epilepsy, 105 had a family taint (about 35 per cent); out of 208 cases of hysteria, 165 had a family taint (about 80 per cent). Various specialists on mental disorders have found

reason to believe in hereditary transmission in from 25 to 85 per cent of their patients, the diversity being doubtless in part due to the great variety of nervous diseases." (Thomson, *Heredity*, p. 294.)

Because a specific disease afflicting a parent does not reappear in the children, the belief in heredity is often weakened. But as the lowered vitality rather than the specific disease is inherited, a variety of kindred diseases may appear in successive generations of the same family. There are many diseases which are closely related because they develop as a result of a devitalized system. Among such are tuberculosis, scrofula, and many glandular and skin diseases. The specific disease may be pulmonary consumption, scrofulous tumor, or cancer. There is a whole train of afflictions akin to deaf-mutism. Congenital deaf-mutes are usually defective in mind and body. Ordinary deaf-mutism is closely allied to idiocy, and is one of the hereditary neuroses. "In the family of the deaf-mute, inquiry will frequently discover idiotic, epileptic, blind, or scrofulous brothers and sisters; dipsomania, insanity, epilepsy, phthisis, or imbecility in the parents or earlier ancestors, and like conditions in collateral branches of the family. . . . Occasionally a whole family is found deaf and dumb." Insanity is almost inseparably connected with neurotic degeneracy, and, according to Sachs, "Heredity is the potent factor in the causation of juvenile and adult insanity." (*Nervous Diseases of Children*, p. 610.)

Life-insurance companies place the utmost confidence in heredity. They make the most searching inquiries concerning the health of ancestry and relatives. Many a person is rejected solely on grounds of hereditary taints, even though he may be apparently a perfect risk. Insanity and suicidal tendencies are regarded with extreme suspicion. Diseases frequently and degeneracy always have a family history. In discussing the question frequently only the immediate parents are considered, when the whole complex of ancestral bequests must be taken into account.

Conklin says (*loc. cit.*):

If a disease is due to some defect in the hereditary constitution, it is inherited; otherwise, according to our definition of heredity, it is not. Of course no disease develops without extrinsic causes, but when one individual takes a disease while another under the same conditions does not, the differential cause may be an inherited one, or it may be due to differences in the previous conditions of life. There is no doubt that certain diseases run in families and have the appearance of being inherited, but in this case, as in many others, it is extremely difficult in the absence of experiments to distinguish between effects due to intrinsic causes and those due to extrinsic ones

Recent Experimental Evidence.—Professor Vernon Kellogg, of Stanford University, experimented with silkworms to study the influence of heredity and of environment. By giving three groups of silkworms of the same qualities as nearly as possible different rations of mulberry leaves, there resulted "big moths, middle-sized moths, and dwarf moths." By feeding three other groups of different ancestry exactly the same rations it was impossible to make them develop similarly. The experiments show that environment may exert a tremendous influence, developing inherent potentialities, yet no possible combination of environmental circumstances can overcome the profound influences of heredity.

"The facts of Mendelian inheritance and their explanation have carried us a long way in our attempts to reach the goal of being able to prophesy, with a high degree of confidence, what will be the specific hereditary outcomes of matings of plants and animals and men in which contrasting specific traits are involved. The principles and the mechanism of Mendelian inheritance are well determined. But the behavior of each trait has to be worked out for each species of plant or animal, or for man." (Vernon Kellogg, "The New Heredity," *Atlantic Monthly*, November, 1922, p. 584.)

Relation to "Intelligence Quotient."—The recent world-wide movement in intelligence testing started by Binet about 1905 is really a study in hereditary individual differences in children. It is an attempt to find out in a definite quantitative way just how children differ in native ability from given standards of intelligence. So much progress has been made

that students can be and are much better classified than before methods of measuring were established. A little progress has also been made in measuring definitely the different types of hereditary ability. Schools for backward children lacking in a normal amount of hereditary ability have been established for some time. More recently schools for especially gifted children have been established here and there.

Thus, while teachers should say little about hereditary differences in school children, they need to know the laws of heredity and the means of discovering hereditary aptitudes and limitations. The science of classification in schools is based mainly upon such knowledge. Society needs to realize the great laws of heredity and also how to utilize environment to develop hereditary potentialities to the greatest possible maximum.

Summarized Conclusion.—"The general trend of all recent work on heredity is unmistakable, whether it concerns man or lower animals. The entire organism, consisting of structures and functions, body and mind, develops out of the germ, and the organization of the germ determines all the *possibilities* of development of the mind no less than of the body, though the actual realization of any possibility is dependent also upon environmental stimuli." (Conklin, *loc. cit.*, p. 319.)

"However one may choose to take sides on the question as to whether heredity or environment is the more important, it must be agreed that the fundamental basis of all human efficiency is to be found in the physical and mental constitution which is given to one as a legacy by his ancestors. We start with an inheritance good or bad, and upon this basis our success or failure must be established." (Hollingworth and Poffenberger, *Applied Psychology*, 1917, p. 21.)

To set forth the influence of heredity is not an attempt to minimize the effects of environment. Each plays a part in the development of every individual. To ask which is the more important is like asking "Which is more important in sustaining life, oxygen or nitrogen?" Life could not exist without both. This chapter is simply an attempt to analyze

properly the influence of heredity. Sometimes the superficial sociologist asserts that simply by making the environment of all people alike would eradicate all individual differences. He overlooks the fact that some people create their own environment to a much more marked degree than others. On the other hand, the superficial believer in the all-powerful force of heredity preaches a doctrine of fatalism.

Educational Bearings.—A knowledge of heredity is of great value in education. It does not mean that the teacher must necessarily study the ancestors of the pupil, but it does mean that the teacher should study with the greatest possible care the potentialities of each pupil. The main thing the teacher can do is to develop the capabilities which the pupil possesses. Too often the teacher spends most of the time in trying to get the pupil to do things in directions in which he possesses little or no capability, and in so doing overlooks wonderful latent abilities. A study of heredity must impress one with the fact that great individual differences exist among pupils. No two are alike and can never be made alike, no matter what influences are brought to bear. Applications of some of the foregoing facts are considered in the chapters on "Instinct," "Individual Differences," "Measuring Intelligence," "Predicting Performance," and "Psychology in Vocational Guidance."

One of the most fundamental problems of education is to determine what the child knows or has at command as capital. This capital may have been bequeathed him by his ancestors as an hereditary endowment or it may be due to postnatal acquisition. In either case the teacher should know what—if she can know the whence so much the better. But to save precious time she must know what funds of knowledge given children have; and any studies which point out tendencies in groups will enable the teacher the better to deal in probabilities concerning individuals. This is scientific, for science is that which enables us to interpret facts through all other facts of a kindred nature. Science endows one with the gift of prophecy; the scientist is a prophet.

Lest there might be some misapprehension, it is distinctly asserted here that there is no thought of assuming that heredity gives any political rights. It is absolutely contrary to all principles of democracy that any rights to govern are handed down as heredity prerogatives. Election by one's peers is the only possible just method of being given the right to govern. By popular suffrage only can any people ever expect to secure rulers of the highest ability. Hereditary monarchs are as apt to be mediocre as geniuses, knaves as righteous men, insane egotists as wise humanitarians.

There are many more very important questions connected with this fascinating subject but which it will not be possible to discuss in this elementary book. Among the most interesting and important of these questions is that known as the transmission of acquired characters. That question stated briefly is: "Are the effects of modifications of structure and function produced in a given individual transmitted to offspring born subsequent to the modification?" One school of thinkers, the La Marckians, maintains that whatever affects a given individual is most certainly repeated in posterity. The Weismannian school, on the other hand, asserts that such is a scientific impossibility. The arguments have been extended and heated, and there is much to be said on each side. Before a final solution is possible, there must be much more observation and experimentation.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Mention some physical trait among animals that you know is present in several successive generations of the same family. 2. The same concerning some hereditary human feature. 3. In a similar way consider some apparently hereditary mental quality in some family. 4. Is it easy to determine whether mental characters are hereditary? 5. Have you read anything on eugenics, euthenics, Mendelism, transmission of acquired characters? 6. What is meant by social heredity? 7. Of what practical value is a knowledge of heredity? 8. Find out the cost in your state to maintain the (*a*) feeble-minded, (*b*) insane, (*c*) criminals.

References for Further Reading

1. Bolton, *Principles of Education*, chap. IX.
2. Conklin, *The Phenomena of Inheritance*.

3. Davenport, *Eugenics: The Science of Human Improvement.* Entire book.
4. Guyer, *Being Well Born.* Entire book.
5. Jennings (Watson, Meyer, and Thomas), *Suggestions of Modern Science Concerning Education*, chap. I.
6. Thomson, *Heredity.* Entire book.
7. Tyler, *Growth and Education*, chaps. II, III.
8. Waddle, *An Introduction to Child Psychology*, chap. IV.
9. Walter, *Genetics: An Introduction to the Study of Heredity*, chaps. I, II, V.
10. Watson, *Psychology from the Standpoint of a Behaviorist*, chaps. VI, VII.

CHAPTER VI

NATIVE ENDOWMENT: INSTINCT

Instincts Not Confined to Lower Animals.—Instincts are ascribed by the uneducated only to lower animals. Because man comes into the world a helpless creature and remains so for such a long period, it is thought that human beings possess no instincts. These traits are thought to be special provisions for the guidance of the animals lower than man. But although man is not limited to habitual reactions, either racial or individually acquired, he possesses even more instincts than other animals. The reason we do not recognize instinctive traits in man is because they are exceedingly complex, rendered so through modification by each other, by habits, and by education.

James has said that man possesses all the instincts of the lower animals and many more. This is not literally true. Even though man were a direct descendant of all the lower animals, we should remember that recapitulation is not complete. Many organs and functions have been excised in the course of evolution. Old instincts have died out and new ones have been born. It would, however, be correct to say that man possesses as many instincts as the lower animals and vastly more. Instincts are simply inherited potencies or impulses which cause the individual to act in particular directions. Abilities in music or mathematics are just as truly instincts as the phenomena of nest-building by birds or the spinning of webs by spiders.

Illustrations and Meaning of Instinct.—It is a matter of common observation that the lower animals perform many activities without previous training on the part of the individual. These activities apparently are performed in a definite and uniform manner by all members of the species.

Among typical illustrations we may cite the beaver building its dam when of a certain age, at a certain time of the year, and in a tolerably definite manner. The wild goose migrates southward every year, and again in the spring its well-known honk may be heard as the flock seeks northern latitudes. Honey-bees build their comb in an apparently invariable way from year to year; wasps, bumblebees, yellow-jackets, hornets, each have characteristic ways of constructing their nests and of gathering food. Birds of a given species build nests peculiar to themselves; dogs bury bones; hyenas are ever vigilant; and cats play with captured mice; cattle, deer, and other animals are afraid of red objects. Many animals possess at birth, or almost immediately after, fully developed reactions for food-getting, and many exhibit very early attempts at self-protection from supposed foes. The foregoing activities are denominated as instinctive, and instinct may be defined in a preliminary way as follows: *Instinct is an inborn tendency on the part of a given individual to act in a certain way under given stimuli without any foresight (necessarily) of the end to be accomplished, and without any previous education on the part of the individual.*

Among human instincts which are most readily apparent the following are typical: Sucking, biting, clasping with fingers and toes, carrying objects to the mouth in infancy, crying, smiling, protruding the lips, frowning, gesturing, holding the head erect, sitting, standing, creeping, walking, climbing, fighting, fear, hunting, parental feelings.

The writer uses the term instinct with a somewhat wider significance. It is considered as synonymous with hereditary capacity, potentiality, or innate power. Some writers define "instinct as an hereditary pattern reaction, the separate elements of which are movements principally of the striped muscles." (Watson, *Psychology from the Standpoint of a Behaviorist*, p. 231.) The wider significance as employed by Marshall (*Instinct and Reason*) seems more correct. In all probability the main difference is in the terminology. What is intended is a consideration of the inborn power, ability, or capacity

which enables some individuals to accomplish what is impossible to other individuals not so equipped innately. We have come to consider the differences of the I. Q. of different individuals and the constancy of the I. Q. of an individual through life. The I. Q. represents an inherent potentiality or capacity of the individual and is exactly what is meant by instinct in the following discussion. We might almost say that the "I. Q." is one's "innate quality" for learning.

With this interpretation such qualities as speech, play, sociability, curiosity, constructiveness, and abilities in music, mathematics, languages, philosophy would be classed as instinctive. Some would object that these are not instincts, but that they represent individual acquisitions. That is true, but why can some individuals (human beings) learn them and other individuals (*e. g.*, dogs) not? If language, for example, were wholly a matter of imitation why does not Fido learn to speak when he has so much better opportunity than some poor waifs? The answer is that the human child possesses some inherent capacity (instinct) that the dog does not.

Lewis (*Democracy's High School*, p. 52) gives an apt characterization of some instinctive tendencies of the high-school girl. He says:

> When the girl comes to the high school, she is a tall, lank, awkward, rompish, bashful, self-conscious, freakish, lovable youngster, the idol of her father's heart. When she leaves the high school after four years, she is a neat, trim, graceful, self-possessed, responsive, sweet girl-graduate, soon to be the idol of somebody else's heart. This transfiguration, however, was not the work of the high school; it must be credited to Nature.

Modifiability of Instincts.—It has been a popular notion that instincts are fixed and invariable. Nothing could be further from the truth. It is true that the appearance of an instinct depends mainly upon the maturity or ripeness of the organism. For example, the beaver generally begins to build its dam, the bird to build its nest, and the child to walk and talk, when their bodily structures have reached a certain maturity and inner impulse prompts to certain activities.

But instincts may be hastened or retarded by various conditions. The kind of weather, altitude, latitude, and conditions of the soil all affect the time of flowering and fruiting in plants. Wheat and corn taken north ripen later than usual until acclimated, but if moved southward they are hastened in their development. People living under the equator mature, grow old, and die sooner than those in temperate zones.

House-martens now build their nests beneath the eaves of houses while formerly they lived in rocky haunts. Barn-swallows also build their mud abodes beneath the eaves of barns. This they cannot have done long, because barns are a modern invention. Chimney-swallows must have had a different method of nest-building before the invention of chimneys. Domestic ducks in Ceylon have lost their former natural love for water, and are entirely terrestrial in their habits, while some other ducks have been known to forsake their marshy haunts and build their nests in trees, bringing their young to the water on their backs. Certain species of Australian parrots that were honey feeders have become fat feeders since the development of the sheep industry, which enables them to prey upon the carcasses of dead sheep. They have learned to select unerringly certain portions of the carcass which affords the choicest morsels. The polar bear has learned to bite its prey instead of hugging as other bears do. Many transformations in progress, such as in whales, seals, and dolphins will come to mind.

The domestication of wild animals affords a vast array of most important illustrations of the transformation of habits, instincts, and even of structure. The testimony should be very suggestive of the possibilities of race transformation in the human species. Domestic horses have lost most of their primitive wildness, and the new instinct of docility renders them of inestimable service to man. The cat in its wild state is one of the fiercest and most untamable of creatures, but once domesticated it is one of the gentlest, and most attached to man. It is a far cry from the fierceness and restlessness of the wolf and the jackal to the domestic dog, but the ancestry

of the latter can easily be traced to the former. Contrast the sneaking, ferocious denizens of the forest with well-bred shepherd or Newfoundland dogs, which display such affection, fidelity, and sagacity in protecting the interests of their masters. Even among domestic dogs we find great plasticity and variability of instincts and structure—all the result of definite attempts to produce and conserve desirable characteristics. Think of the special instincts of the Newfoundland as compared with the greyhound; those of the collie with pointers and setters; and each of these as compared with pugs, poodles, and terriers. Each shows the results of generations of education, conservation, and selection.

Maturing Periods.—It used to be thought that all instincts manifested themselves at birth, but this is now known to be untrue. Even in the lower animals many instincts are deferred for a considerable time after birth. For example, we may cite the instincts of nest-building in birds, comb-constructing in bees, dam-building in beavers, or pointing in dogs. The instinct appears when the organism is mature in development. When the physical structure of the bird, for example, becomes properly developed, the instincts for egg-laying and nest-building will appear. When the child's brain-centres controlling walking, talking, or using the right hand become sufficiently mature, those activities will begin to manifest themselves.

Thorndike says (*Elements of Psychology*, p. 187):

> That an instinctive tendency is born in a human being as a result of the structure of his nervous system need not mean that it is present at birth. Creeping, standing erect, and laughing are surely instinctive, but appear only after months of life. The new feelings and desires which characterize the change from childhood to adult life in the years from thirteen to sixteen are as truly instinctive as the infant's fears. The date of appearance of each instinct is a separate problem.

It is a very interesting and important fact that if instincts are not exercised when they appear they do not develop, but die out. For example, all ducks possess the instinct for swimming, but if they are not allowed to be near water during the

first few weeks of life, they have to be driven into the water. Dogs have an instinct for burying bones, old shoes, food, but if they are kept away from the earth for the first few months of life, although they try to bury things on the floor, they find it useless and cease to try, and the instinct dies out.

Thorndike further comments:

That a tendency is due to inborn nervous make-up need not mean that it will remain all through life. On the contrary, all instincts tend to die out if not given exercise, and may be killed off—or, to use the technical term, inhibited—when circumstances are so arranged that their manifestation leads to discomfort. Thus chicks brought up in isolation from the parent hen do not show, after ten or twelve days, the tendency to follow her; and children are taught by punishment to abandon their original tendency to grab every new and attractive object which they see.

James (*Talks to Teachers on Psychology and Life's Ideals*, p. 61) emphasized the same idea in the following words:

In children we observe a ripening of impulses and interests in a certain determinate order. Creeping, walking, climbing, imitating vocal sounds, constructing, drawing, calculating, possess the child in succession; and in some children the possession, while it lasts, may be of a semifrantic and exclusive sort. Later, the interest in any one of these things may wholly fade away. Of course, the proper pedagogic moment to work skill in, and to clench the useful habit, is when the native impulse is most acutely present. Crowd on the athletic opportunities, the mental arithmetic, the verse-learning, the drawing, the botany, or what not, the moment you have reason to think the hour is ripe. The hour may not last long, and while it continues you may safely let all the child's other occupations take a second place. In this way you economize time and deepen skill; for many an infant prodigy, artistic or mathematical, has a flowering epoch of but a few months.

In order that the child may develop naturally, it is necessary that each stage of growth be passed through normally before passing on to the next higher. For example, it is well known that the tadpole's tail does not drop off, but is absorbed in some way during the period of the growth of the hind legs. It has been demonstrated by experiment that if the tail is cut off, the frog grows up deformed. Hence Doctor Hall has

coined the expression "In education don't cut off the tadpole's tail." A little girl was watching with great interest the process of the incubation of hen's eggs. As the chicks neared the time for emerging from the eggs, some were several hours in pecking their way out of the shell. The little girl felt sorry for them and concluded to help them out. She broke some of the shells. The result you know. Those chicks either died or were deformed.

Every farmer knows full well that cultivation of his corn at the right time means more than at any other time. Suppose he allows the weeds to grow up around the corn and the stalks become yellow and sere; no amount of cultivation can restore the corn to its original possibilities. The nascent period is past, never to return again. But have we learned the application of such lessons to the process of education?

Educational Applications: General.—All effective education must take into consideration the latent possibilities of the child. What he becomes depends upon his inborn capacities as well as upon his training. To educate wisely we must know (1) what inborn capacities the child possesses, (2) the time of their appearance, and (3) what will bring these powers to fullest development. If a child possesses a high degree of latent ability in a given direction, *e. g.*, in mathematics or in music, it will be easy to make a mathematician or a musician out of him by right training. But if he possesses a low degree of ability in either of these, no amount of training will be of much effect, and the efforts of all the teachers in the world would not accomplish much.

Thorndike says (*Education*, p. 91):

> The task of education is to make the best use of this original fund of tendencies, eradicating its vicious elements, wasting the least possible of value that nature gives, and supplying at the most useful time the additions that are needed to improve and satisfy human wants. This task is complicated by the fact that original tendencies are often "delayed"—that is, appear only when a certain stage of mental growth is reached—so that education has to wait perhaps longer than it wishes before it can count upon them. It is further complicated by their transitoriness. Many tendencies appear for a time, but wane if

not given exercise and reward; so that education has to strike while the iron is hot. If the response is sought too early, effort is wasted; if it is sought too late, the effort may fail altogether.

He comments further (*Principles of Teaching*, pp. 22, 32–34):

Education may also be made more and more economical in proportion as it utilizes the forces of natural tendencies to attain its ideal ends. Whenever we work with rather than against nature, the task becomes easy and the burden light. Fractions become easy with the help of apples and blocks and knives and jig-saw, because the instinctive tendencies to attend to concrete objects and to enjoy physical action and manipulation are called into service.

Teaching may be wasteful or even harmful by neglect of the fact of delayed instincts and capacities. Theology for the ten-year-old in Sunday-schools and Jane Austen's novels for high-school boys are much the same as cabbage for babies. Cabbage is a good food only when the capacity to digest it exists. Teaching little girls to be attentive to their dress and appearance is much the same as trying to teach an infant of six months to walk. The interest in clothes and looks will come of itself with adolescence, just as the walking instinct will come of itself at the beginning of the second year.

Just as the delayed appearance of inborn tendencies makes too early teaching wasteful, so their transitoriness makes too tardy teaching fruitless. The manual dexterity of the pianist, for instance, must be acquired early in life, if at all. The instincts and capacities important in education are, however, for the most part long-lived, and, if not suppressed by actual ill treatment, persist through the years of school life without special stimulation from teachers. So with the instincts of action, curiosity, the love of outdoor life and sport, emulation, and many others.

Application in Some Special Instincts: (A) Expression.— Children often invent gesture language. Deaf-mutes also do so, even when isolated from speaking people. Ribot quotes Gérando as saying that: "Children of about 7 years old who have not yet been educated make use of an astonishing number of gestures . . . in communication with each other." As a further illustration of this spontaneous, natural language, he says that: "Gérando and others after him remarked that deaf-mutes in their native state communicate easily with one another. He enumerates a long series of ideas which they ex-

press in their mimicry and gestures, and many of these expressions are identical in all countries." (*Evolution of General Ideas*, p. 40.)

This instinct for expression should receive proper attention. As soon as the child manifests a desire to communicate his ideas in speech, his crude, spontaneous, and more deliberative attempts should be encouraged. Instead of mimicking the child in his baby expressions and helping to fix the wrong form in his mind, one should repeat for him the correct form distinctly and encourage the child (not nag him) to imitate. The vocal organs are now ripe for utterance and should be exercised. If the child does not develop the speech organs during this nascent period, he will ever be slow, halting, or deficient in the use of words. Certain it is that new words are accumulated with amazing rapidity during this budding period. The two-year-old child has amassed, within a year, from 300 to 1,200 words, representing ideas, and may have as many more parrot-words, *i. e.*, sounds imitated without an understanding of the meanings. These latter have been gathered from rhymes, jingles, and from conversation not understood, and from chance association of sounds with objects or actions. Now even these parrot-words are important, for they gradually acquire fulness of meaning. Words are, as Doctor Harris has said, like bags; once acquired, they hold all the perceptions and reflections that relate to the idea symbolized by the word.

Not only should the child be assisted in enunciation, but his environment should be such as to lead to the production of ideas. Although I do not coincide with the renowned Max Müller that there can be no thinking without words, yet it is doubtless true that the best thinking utilizes words as instruments. The child that is properly environed, who gratifies his appetite for seeing, hearing, and touching things, who is led to think about these things (for thinking does not hurt children), and who is not overstimulated, will surely acquire words as mature people acquire tools to accomplish their mechanical work.

The instinct of curiosity, the constructive instinct, and the

inborn tendency to play, all co-operate in the acquisition of language. The child must see and examine things for himself; he should not stumble upon them all by chance; designedly he should be led to where things are; he must be helped to see them aright; he must have facts told about them; he must be questioned about them; and, above all, he must have questions answered that he will surely ask. In this way he will pick up much language; he will have given to him many new words; he will ask terms from you, and he will even coin them for himself.

(B) **Curiosity.**—Curiosity is a fundamental instinct, observable far down in the scale of animal life. It is apt to be coupled with fear in the presence of strange objects. Who has not seen horses, cattle, sheep, and swine hovering around a newly discovered and strange object, oftentimes walking round and round, hovering in its vicinity, but ever with nerves tense, ready to make off with the greatest speed on the discovery of apparently harmful or undesirable signs? Any one who has tried to catch a horse in a pasture by luring him with a pretense of food has received a lasting remembrance of this blending of curiosity and fear. Small children, and even adults, often manifest similar states. I have seen a child of one year cry with fear on seeing an umbrella, but no amount of persuasion could bring her away from its vicinity, so fascinating it seemed. Many adults often flirt with the dangerous and uncanny in the same way. Who has not gone through a dark wood, a dark room, all quaking with fear, but curious to ferret out some mystery? Every one would fain take a turn at hunting for spooks in a haunted house.

Spencer says:

Whoever has watched with any discernment, the wide-eyed gaze of the infant at surrounding objects, knows very well that education *does* begin thus early, whether we intend it or not; and that these fingerings and suckings of everything it can lay hold of, these open-mouthed listenings to every sound, are the first steps in the series which ends in the discovery of unseen planets, the invention of calculating engines, the production of great paintings, or the composition of symphonies and operas. This activity of the faculties from the very first being

spontaneous and inevitable, the question is whether we shall supply in due variety the materials on which they may exercise themselves; and to the question so put, none but an affirmative answer can be given. (*Education*, p. 128.)

Lloyd Morgan gives expression to a coincident opinion where he says:

Herein, then, lies the utility of the restlessness, the exuberant activity, the varied playfulness, the prying curiosity, the inquisitiveness, the meddlesome mischievousness, the vigorous and healthy experimentalism of the young. (*Habit and Instinct*, p. 162.)

The child, through his instinctive curiosity, is a born investigator. Normally he pulls things to pieces to see how they are made and how they go. His unwise elders often condemn what they believe to be innate destructiveness, but he is simply trying to satisfy his craving for knowledge. To keep alive this instinct and further its normal development is high teaching art. Too often before the end of school life the instinct has completely atrophied. To get the college student to desire to know is the most difficult task before the college instructor. Not infrequently before the college is reached all knowledge is taken in prescribed doses, and largely because ill consequences are feared if directions are not followed.

(C) **Activity and Constructiveness.**—A child of six months accidentally knocks two tin cans together, and discovers that he has done something. He immediately strives to continue this experiment, and his beaming countenance gives ample evidence of the satisfaction gained. At eight months a child accidentally dropped a teaspoon upon the floor. When the teaspoon was given to the child again, he at once began to exert himself to repeat the dropping process. After that, whenever the spoon was given to him, the dropping recurred. Evidently the child's desire to repeat the action was prompted not so much by the pleasurable noise as the satisfaction of doing something. From the time children can walk I have found them anxious to do things that grown-up people do.

They are anxious to dust, sweep, wash, iron, bake, make beds, carry things, read, write, and go on errands. They are called lazy a little later on, but I believe that a normal, healthy child has not a lazy fibre in its make-up. Its muscles, nerves, and senses are hungry for exercise, and every effort is made by the child to satisfy these cravings. The child may be lazy in the sense that your particular kind of occupation may be repugnant to him, but if you watch the little feet trot all day you can hardly have the heart to call him lazy.

Constructiveness is a fundamental instinct of so much importance as to merit special consideration. All children early exhibit tendencies toward making things. I have noticed a child of seven months trying to place one block upon another in imitation of other children. Miss Shinn tells us that her niece, as early as seven months, would not listen contentedly to older persons playing the piano, but that she was satisfied only when trying it herself. (*Notes on the Development of a Child*, p. 116.)

In these inborn tendencies to activity and constructiveness are the teacher's and parent's golden opportunities. The parent should encourage the little ones to help. In this way the work *habit* will be instilled, and by the time the child is five years of age it may save its mother many steps every day. It can pick up and put away its own playthings, and run on errands. (I have known four-year-olds to go half a mile and purchase correctly things from a store, and to go daily for little grocery orders in the neighborhood.) Most children want to hammer, and saw, and *make*. A child can have no more useful educative appliances than a hammer, some nails, and boards into which he may have full liberty to drive the nails. I have noticed children of two years amuse themselves in this way for hours at a time. They may not develop into carpenters when grown up, but they have gained an education through the process. It is a pity that children cannot have sets of tools and, instead of having all their toys, sleds, and carts made for them, be encouraged to construct them for themselves.

James has put the matter very aptly in the following paragraph:

> *Constructiveness* is the instinct most active; and by the incessant hammering and sawing, and dressing and undressing dolls, putting of things together and taking them apart, the child not only trains the muscles to co-ordinate action, but accumulates a store of physical conceptions which are the basis of his knowledge of the material world through life. Object-teaching and manual training wisely extend the sphere of this order of acquisition. Clay, wood, metals, and the various kinds of tools are made to contribute to the store. . . . To have grown up on a farm, to have haunted a carpenter's and blacksmith's shop, to have handled horses and cows and boats and guns, and to have ideas and abilities connected with such objects are an inestimable part of youthful acquisition. After adolescence it is rare to be able to get into familiar touch with any of these primitive things. The instinctive propensions have faded, and the habits are hard to acquire.
>
> Accordingly, one of the best fruits of the "child-study" movement has been to reinstate all these activities to their proper place in a sound system of education. *Feed* the growing human being, feed him with the sort of experience for which from year to year he shows a natural craving, and he will develop in adult life a sounder sort of mental tissue, even though he may seem to be "wasting" a great deal of his growing time, in the eyes of those for whom the only channels of learning are books and verbally communicated information. (James, *Talks to Teachers on Psychology and Life's Ideals*, p. 146.)

(D) Play.—The educative value of the play instinct has been recognized by kindergartners since the time of Froebel. It has recently received much study by others, and undoubtedly it is a means of intellectual and moral discipline. Both free play and regulated play whose ends are certain discipline are valuable. In the first five or six years the play should be almost entirely free play, without adult restrictions imposed upon it. In the first place, the tonic effects of play upon the nervous system are of great moment. To remove temporary fatigue there is absolutely no substitute for the good old-fashioned recess, with its laugh and shout and capering wildly about.

Play, then, during the early stage of childhood, before the child has gained control over the accessory muscles, should be

largely spontaneous and unrestricted. Even then something may be done to regulate and direct play which does not involve fine co-ordinations. The kindergarten games which include movements involving the larger muscles of the trunk, those controlling the head, arms, and legs, may be engaged in to great advantage. These should have in view the exercise of the *social instincts*. Many little social duties and amenities may be thoroughly inculcated in children through play which is organized and directed by the teacher. Some children recently had a birthday party. The whole direction of the affair was given by the mother. They were helped to arrange the little table, were assigned places, given a few directions, and through imitation of others they carried out the rest of the programme. The little games which the kindergartner directs (though she may seem to be asking their advice) are of immense value in helping children, through imitation and obedience, to learn the fundamental laws of society. These plays should certainly be well adapted to the capacity of the children, never predominantly inhibitive or restraining, rather the reverse. But enough of control should be sought to lead the child to form habits of self-control. Many boys' organizations (*e. g.*, baseball teams) do not hang together well but go to pieces on slight provocation. Bryan concludes from this that therefore play up to about twelve years "should be unhampered, spontaneous, and careless of ends." This may be attributed to the fact that childhood cannot produce leadership. President Bryan concludes that: "Unquestioned obedience to rational, intelligent authority should be the principle in the management of young children, and freedom from this principle will increase with the development of the child." (*Ped. Sem.*, vol. VII, p. 380.)

(E) **The Social Instinct** is one that exhibits itself early. The babe of a few weeks old shows signs of lonesomeness when left alone, especially if it has been much tended. By the time the child is five or six months old absence of accustomed members of the family, especially children, causes no little irritability.

The social instinct furnishes a starting-point for the complete training of the individual for his place in society. The laws of society can be learned only by being in social organizations. A child isolated from the world grows up a social monster, because of the abnormal development of his selfish nature. Rousseau taught that man is by nature a pure being, becoming corrupt by contact with artificial society. Therefore he isolates Emile from his fellows from birth to manhood. But such an individual could not live in society, because he has found no place in it. Law and order, the basis of our social fabric, are meaningless to him. Hence the child must learn the fundamentals of social organizations by subjecting himself to the restrictions imposed by society for the benefit of the whole and the individuals composing the whole.

The family is the first to impose restrictions and extend privileges. Instinctively the child learns about the family organization and also imitates their reactions toward one another. By this undesigned process the child unconsciously forms numberless habits, which will be priceless to him all his life. He should learn, for example, how to treat his parents, brothers and sisters, strangers, how to behave at the table, not to disturb the family or neighborhood peace. But even this would leave him undisciplined in many essential relationships imposed by society at large. There is the school which the child early yearns to attend. I believe all children want to go to school not because it is school, but because many children are there. Now, too early formal school work is injurious, but there is the kindergarten, and if properly conducted it is a blessing to the children. There the children can assemble under pure, wholesome influences, through exercises appealing to the instincts of sociability, expression, and constructiveness learn through play some of the most valuable lessons of their lives. Children of the most disagreeably selfish dispositions may there, with little or no coercion, develop the control and proper emotional attitude for most amiable actions. Through imitation of their fellows they learn to do many things which could never have been beaten

into them, and they drop many habits which could never have been beaten out of them.

One of the most important recent movements in education is the studied attempt to use the school as a means of developing social consciousness in the pupils. This is accomplished, first through the encouragement of organizations like the glee-club, the literary society, and the athletic organizations; second, through the introduction of the social studies in the grammar-school and high school. Through the former the pupils get practice in co-operative enterprises, and through the latter interpretation of social organizations. They are in a nascent stage for the development of the social instinct. If cultivated, the school may become a most effective means for promoting good citizenship.

Application in Learning Arithmetic.—Very great mistakes are often made in the arrangement of courses of study. Certain subjects are required long before the child has developed so as to comprehend them. Other subjects are postponed until after the time they can be acquired to advantage. In other words, some are presented before the budding period, while others are deferred until long after it is past. Arithmetic is one of the subjects which has been badly adjusted to the powers of the child. A great deal of arithmetic is so abstract that no child can master it until near the period of youth, when the brain development makes the mind ripe for abstract thinking. In an earlier chapter attention was called to the waste of time from placing too much formal arithmetic in the primary grades of school. By omitting all arithmetic work from the first two grades it has been found that children are as far advanced in arithmetic by the end of the fourth year as if they had taken it four years.

On the other hand, those parts of arithmetic like the addition, subtraction, multiplication, and division tables can be learned by mechanical memory, which is well developed by 8 or 9 years of age. These processes can be mastered better before 12 than ever afterward. But frequently when the pupil enters the high school his knowledge of these elements

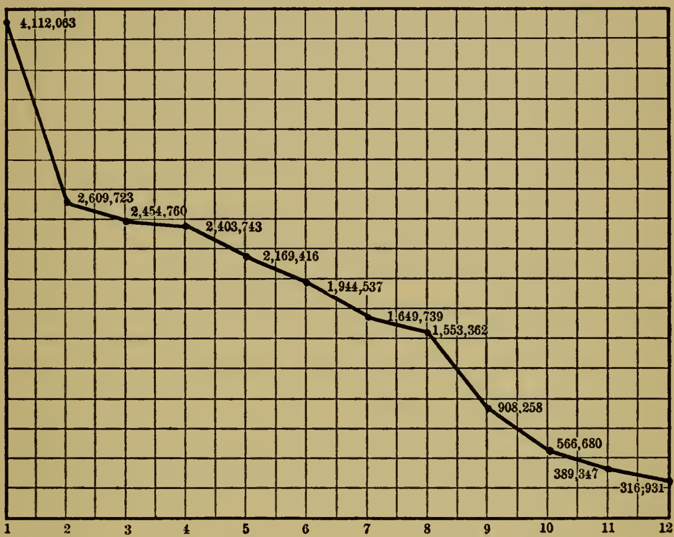
of arithmetic is very inaccurate. Consequently he has hard work to learn processes that could have been mastered so easily before; and he is also deprived of the time for learning more abstract things.

Application in Learning Language.—There is a special period in the life of the child when he can learn to speak language to the best advantage. At the beginning of the period the child continually chatters and shows a desire to talk. It has been called the "la-la" period. If the child has an opportunity to hear speech at that time he acquires language with amazing rapidity. In a few months he acquires a vocabulary that would take an adult many years to gain. Children who come from foreign countries learn to speak our language fluently and with great accuracy in a few months. But their parents usually have great difficulty in trying to learn the language, and they seldom master it. The parents try much harder than the children. They cannot learn to speak the language so readily because the budding period is past. The muscles of the vocal organs have become fixed, and the brain-centres which control speech no longer adapt themselves to new ways of acting as they once did. The case is exactly parallel to that of the adult man who can no longer learn to play new athletic games or gymnasium tricks the same as he could when a boy.

The study of language and grammar are often interchanged in time. Abstract grammar is given at a time when the child could easily learn oral language, and as a consequence he never masters either. Spelling should be completely mastered before the high school is reached, and could be if given by methods adapted to child life and not displaced by so much abstract grammar and arithmetic.

Adjustment in the Grammar-School Age.—A knowledge of instincts is of very great importance in adjusting grammar-school and high-school work. In these stages of school work there is an appalling amount of dropping out of school, as will be seen from the accompanying diagram. It has been generally assumed that poverty is the reason why pupils drop out

of school in such large numbers from the ages of 12 to 16. Undoubtedly there are altogether too many cases that should be explained in that way, but recent studies show clearly that the great majority drop out of school during that period not



SCHOOL ENROLMENT IN THE UNITED STATES FOR THE YEAR 1920
Statistics of State School Systems, 1919-1920; *Bulletin*, 1922, No. 29, U. S. Bureau of Education.

from economic pressure but because they do not wish to go. The work does not appeal to them and they think that they would like to be out in the big, busy world.

They are wrong when they think that the school has nothing worth while for them, but is it not probable that we should heed the suggestion that the school is not well enough adjusted to the particular instincts and inclinations of that peculiar and critical age? The majority of healthy boys and girls are much more interested in physical activities, in doing things, than in conning books and merely learning *about* things. Has the school not been too bookish? To be sure, the shops, laboratories, field trips, and play fields are correcting the defects,

but there is much more to be done. The boys and girls are not averse to using books, if the books deal with subjects that come near to their interests.

Adjustment in Learning Literature.—The study of literature affords an opportunity to observe the importance of adapting the material to the stage of development of the pupils. In childhood, rhymes, jingles, myths, and fairy-tales are eagerly read by most children. Students of childhood have succeeded fairly well in selecting types of literature that appeal. The selections for grammar-school pupils have not been so fortunate. While the pupils respond eagerly to hero tales, stories of boy-and-girl life and adventure, too much that is found in the grammar-school reading-books consists of morality essays, dry facts of history, and political philosophy. This maladaptation is being gradually corrected in our better schools.

The high-school course in literature needs drastic revision on the basis of pupils' interests. The literary masterpieces studied in many of our high schools have been chosen by college professors, from their point of view. For example, Burke's "Speech on Conciliation," while a masterpiece of literary diction and political philosophy, seldom awakens any responsive chord in high-school pupils. I have inquired of thousands of university students regarding this, and the above verdict is almost universal. Similar attitudes are expressed toward "Paradise Lost," "L'Allegro," "Il Penseroso," and others suited to adult minds. They are all excellent pieces of literature and would be enjoyed by the majority of adults, if presented in the right way. But by no method of presentation can much interest in them be aroused in the minds of most immature adolescents. If literature in the grammar-school and the high school is to appeal and motivate the future lives of pupils, the types must be chosen by the pupils. The particular selections exemplifying the types can be determined largely by the teachers.

Arrested Development.—It is well known that plants not cultivated at the proper time, or which fail to receive sunlight and moisture at certain stages, become stunted and remain

dwarfed and sickly. Similarly children that are not properly nourished during the growing periods are checked or arrested in their development. Even if they recover in size at a later time, their development is not natural and they are liable to disease.

Mental powers, no less than physical, are liable to arrest if uncultivated at the opportune moment. Subjects which might be learned with ease at certain times are acquired with the utmost difficulty if postponed until after the nascent period. I have often had occasion to teach algebra to mature persons who had never studied the subject previously. I have also taught it to boys and girls of a dozen years, and have found that the children grasp the subject much more easily and better than the adults. The minds of the latter had become so habituated to the elementary processes that a transition to higher processes was difficult. While we should fix, in the form of habits, all activities that must be continually repeated in the same way, yet we should guard against too definite crystallization of mental processes. Every habit tends to enslave its possessor. Pupils frequently make a mistake in going over subjects again and again simply to get them thoroughly. It is usually better for pupils to take new subjects of reasonable difficulty than to repeat subjects fairly well learned.

Doctor Harris, former commissioner of education, was the first to call attention in a striking way to arrests of development caused through overtraining in certain processes and the neglect of higher ones. He said: "Teachers should be careful, especially with precocious children, not to continue too long in the use of a process that is becoming mechanical."

Summary.—Dewey, though an educational sociologist, recognizes fully the significance of instincts in education. He says (*My Pedagogic Creed*):

I believe that this educational process has two sides—one psychological and one sociological; and that neither can be subordinated to the other or neglected without evil results following. Of these two sides, the psychological is the basis. The child's own instincts and

powers furnish the material and give the starting-point for all education. Save as the efforts of the educator connect with some activity which the child is carrying on of his own initiative independent of the educator, education becomes reduced to a pressure from without. It may, indeed, give certain external results, but cannot truly be called educative. Without insight into the psychological structure and activities of the individual, the educative process will, therefore, be haphazard and arbitrary. . . .

I believe that knowledge of social conditions, of the present state of civilization is necessary in order properly to interpret the child's powers. The child has his own instincts and tendencies, but we do not know what these mean until we can translate them into their social equivalents. We must be able to carry them back into a social past and see them as the inheritance of previous race activities. We must also be able to project them into the future to see what their outcome and end will be. In the illustration just used, it is the ability to see in the child's babblings the promise and potency of a future social intercourse and conversation which enables one to deal in the proper way with that instinct.

I believe that the psychological and social sides are organically related, and that education cannot be regarded as a compromise between the two, or a superimposition of one upon the other. . . . The only possible adjustment which we can give to the child under existing conditions is that which arises through putting him in complete possession of all his powers. It is impossible to prepare the child for any precise set of conditions. To prepare him for the future life means to give him command of himself; it means so to train him that he will have the full and ready use of all his capacities, that his eye and ear and hand may be tools ready to command, that his judgment may be capable of grasping the conditions under which it has to work, and the executive forces be trained to act economically and efficiently. It is impossible to reach this sort of adjustment save as constant regard is had to the individual's own powers, tastes, and interests—save, that is, as education is continually converted into psychological terms.

In sum, I believe that the individual who is to be educated is a social individual, and that society is an organic union of individuals. . . . Education, therefore, must begin with a psychological insight into the child's capacities, interests, and habits. It must be controlled at every point by reference to these same considerations. These powers, interests, and habits must be continually interpreted—we must know what they mean. They must be translated into terms of their social equivalents—into terms of what they are capable of in the way of social service.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Would a kitten learn to catch mice if it never saw adult cats do so? 2. Would canaries learn to sing if they never heard adult birds sing? 3. Mention some instinctive reactions you have observed in little children. 4. Would girls behave differently from boys in any particulars if conventionalities did not teach them? 5. Is there any psychological correctness in saying of some boy, "He's all boy"? 6. Do some pupils seem to "take naturally" to certain subjects? 7. Do some boys and girls learn to swim much more rapidly than others? Why? 8. Why do youths fall in love? 9. How should the fighting instinct in boys be treated? 10. Is there any relation between instincts and interests? 11. Name an instinct of special help in nature study; in manual training; in high-school literature. 12. On the basis of nascent periods what kinds of literature would be desirable for first-grade pupils? for sixth-grade pupils? for high-school pupils?

References for Further Reading

1. Bolton, *Principles of Education*, chap. VIII.
2. Cameron, *Psychology and the School*, chap. III.
3. Colvin, *The Learning Process*, chaps. III, IV.
4. Colvin and Bagley, *Human Behavior*, chaps. VIII, IX, X.
5. Dewey, *The School and Society*, chap. II.
6. O'Shea, *Mental Development and Education*, chaps. I, II.
7. Starch, *Educational Psychology*, chap. II.
8. Thorndike, *Education*, chap. V.
9. Thorndike, *Principles of Teaching*, chap. III.
10. Watson (Jennings, Meyer, and Thomas), *Suggestions of Modern Science Concerning Education*, chap. II.

PART III

MODES OF LEARNING AND BEHAVIOR

CHAPTER VII

EDUCATION MEANS ESTABLISHING MODES OF BEHAVIOR

Behavior the Goal of Education.—It has been well said that education should not have for its end to teach men to know what they do not know, but to teach men to behave as they do not behave. Education has too often been considered a passive process, a pouring in of information in order that pupils may know. It is rather a dynamic process, a process of providing stimuli which are to awaken appropriate responses. All life is evaluated in terms of behavior. The sole function of consciousness is to determine behavior. The problem of education is to control and direct behavior. Watson says:

> Psychology, when all is said and done, is a *study in behavior;* the problem of the schoolroom and of the laboratory is to find out what an individual can *instinctively do*, and what he can be *trained to do*, and the *methods* which will lead him most easily and quickly to do both those things which society demands of him and the things which he alone as an individual can do. (*Suggestions of Modern Science Concerning Education*, p. 54.)

Expression an Index to Mind.—The only means we have of studying the mind of another is through his various expressions. Mind discloses itself to others only by expression, as in talking, writing, drawing, painting, constructing machines or controlling them. Efficiency of mind is judged wholly by the outward expression revealed to the view of the world. A student's knowledge of mathematics or psychology must be judged by what he says or writes; one's knowledge of art by what he can produce. We do not really know whether another can sing or play the piano until he manifests it in expression. A poetic soul is unknown until it bursts into song;

an author's ability to write may properly be challenged until he gives an actual demonstration. Similarly, an engineer must exhibit his skill, an architect his plan, a general his generalship, a statesman his statecraft, in some objective results. In fact, we know nothing of the perceptions, memories, emotions, reasonings, choosings, willings, hopes, joys, and sorrows of others except as they give expression to them through some muscular activity. Another may love us ever so tenderly or hate us ever so bitterly, but unless we detect some of his outward expressions of it we are entirely oblivious of the fact. To illustrate, a man is angry. How do others know it? Solely by his expression. He may clench his fist, knit his brows, gnash his teeth, raise his arm to strike, utter an oath in a major key, if he believes himself stronger than his foe; if inferior, he may whisper in impotent rage and skulk away, because incapable of defense or retaliation. Another angry man might express himself in a more indirect but no less effective manner by calling the police, waylaying his enemy, going to war, writing articles of denunciation which would bring social reprobation upon his enemy, or waging a war of ballots which would express indignation and tend to secure retribution and reform. The enemy might be an individual or a violation of principle. Again, consider the various manifestations of fear. The child may run with breathless haste, eyes dilated, tears streaming, heart palpitating, face flushed, or it may be blanched and palsied. A mother immersed in grief over the loss of her loved little ones may be hysterical, or speak with voice trembling, quivering lips, have a pallid countenance, and be depressed almost to complete paralysis. In any case, the emotions are expressed in some form of action, sometimes decidedly external; in others more internal, repressed, and perhaps much diffused, but the only means we have of understanding them is through some form of motor expression.

James says (*Talks to Teachers*, p. 26): "The brain, so far as we understand it, is given us for practical behavior. Every current that runs into it from skin or eye or ear runs out again into muscles, glands, or viscera, and helps to adapt the animal

to the environment from which the current came. It therefore generalizes and simplifies our view to treat the brain life and the mental life as having one fundamental kind of purpose." He says that even the "inessential, 'unpractical' activities are themselves far more connected with our behavior and our adaptation to the environment than at first sight might appear. No truth, however abstract, is ever perceived, that will not probably at some time influence our earthly action. You must remember that, when I talk of action here, I mean action in the widest sense. I mean speech, I mean writing, I mean yeses and noes, and tendencies 'from' things and tendencies 'toward' things, and emotional determinations; and I mean them in the future as well as in the immediate present. As I talk here, and you listen, it might seem as if no action followed. You might call it a purely theoretic process, with no practical result. But it *must* have a practical result. It cannot take place at all and leave your conduct unaffected. If not to-day, then on some far future day, you will answer some question differently by reason of what you are thinking now. Some of you will be led by my words into new veins of inquiry, into reading special books. These will develop your opinion, whether for or against. That opinion will in turn be expressed, will receive criticism from others in your environment, and will affect your standing in their eyes. We cannot escape our destiny, which is practical; and even our most theoretic faculties contribute to its working out."

Motor Activity in Relation to Health or Disease.—An abundance of well-controlled movements, as exhibited in play or interesting work, are a sure sign of healthfulness—physical and mental. On the other hand, an excess of unco-ordinated movements is a sure symptom of disease. We should always be suspicious of twitchings of the eye or facial muscles, unsteadiness of the body, head, hand, or fingers, or of stammering and stuttering. Likewise we should study closely the child who drums incessantly with the fingers or the feet, who is restless, constantly changing position to no purpose, rolling the eyeballs, or drooping the head; whose arms hang limp by

the side, who drags his feet and stumbles; who cannot throw a ball, run, trundle a hoop. Such a child is either fatigued, has not slept sufficiently, or is ill nourished. Children are often excitable, passionate, melancholy, and fretful. During sleep such children are seldom in repose; they grind the teeth, are troubled by incessant twitching of the muscles, are disturbed by dreams, frequently have night-terrors, and sometimes are troubled with somnambulism. A child in perfect health is also full of movement, but the actions are controlled. He runs about from dawn till dark, plays, capers, chatters, laughs, and is constantly giving natural expression to states of mind and body. A child who is ill or excessively fatigued does not frisk about, ceases play, mopes or curls up in a corner and talks little, laughs less, or is quiet until normal conditions are restored. A normal, healthy child is not quiet a single moment of his waking life.

Inhibition.—Inhibition is really a form of activity, although it does not issue in movement but in the stoppage of movement. The child who learns to sit still in school at proper times, to check the impulses to laugh, to whistle, to talk, and to shout is exhibiting action—controlled action. Similarly the one who refrains from saying malicious things about neighbors who may deserve it, who spreads the mantle of charity over real faults of others, who keeps his hand from his neighbor's pocket, who is faithful to a trust confided to him, is manifesting activity no less genuine and real than if he had acted upon all possible impulses of the moment. The child in training has to learn to master a multitude of impulses to forbidden actions. Naturally he would like to whisper, run, and look out of the window, or play with his marbles, but a set of developed, warring impulses restrains him. The child is continually beset with stimuli which allure him from the tasks which we set him. Until he has developed a great many habits of acting and doing, the chances are that the momentary stimuli will succeed in bringing about corresponding reactions, and the things we desire him to do are forgotten. Hence the necessity of constant supervision of the child if we wish him

to succeed in resisting undesirable stimuli which we select for his training. If we can only make the desired stimuli as interesting as the undesirable, alluring ones, we may secure spontaneous responses.

The Purpose of Motor Activity in Education.—The child's nervous system is ready to respond to a great variety of stimuli with equal readiness. One of the most important tasks of the teacher is to select desirable stimuli and keep them beating upon the child until settled pathways of discharge have been established and at the same time to shield him from undesirable environment. With age, developed habits of action, and fixity instead of plasticity, there is much less possibility of being influenced by new forces. Here is an opportunity of education. A child can learn a new movement, say skating, much more readily than the adult, because the child's nervous system is so sensitive to many stimuli, while the adult has become impervious to all that do not fit in with his modes of action. Education deals largely with the problem of producing modifications of the mind. As the mind and its modifications can only be known through external expression, it becomes highly important to consider how ideas are correlated with expression, and how stimuli may be utilized to produce efficient reactions, and how in turn reactions may influence intellectual processes. Unfortunately the formalists have overlooked the necessities and importance of expression in education and have devoted all their attention to the absorptive process.

It is an auspicious sign that present-day educators are seeking earnestly for ways and means of incorporating into the formal curriculum more and more work which involves motor activity. We are beginning to realize that efficient education is not a process of cramming words into the child's memory. Ideas are incomplete until they are *real-ized.* The most distinctive feature of many ideas is this motor process. Most ideas are of little consequence until they find application in some form of outward expression or influence some activity, at least indirectly. "We learn by doing" is a trite statement,

but only half understood by many, and heeded in practice by still fewer. However, the slogan "From impression to expression" is becoming an important watchword of modern teaching. It needs to be supplemented by the statement "Through expression to clear impression." But it is only just beginning to be realized that the subject of motor education demands special consideration. Even many of the advocates of motor training have in mind only the skill resulting from handiwork. The stock arguments made in favor of manual activities are somewhat as follows: "Manual training, handicrafts, and domestic science furnish activities which reveal inaccuracies of execution; they give opportunity to make finished products; they furnish physical exercise; they develop an appreciation of the dignity of labor; they enable the child to follow his interests, etc." These are all valid, but they do not touch the most fundamental reasons.

That every mental process has a motor accompaniment is a singular and significant fact. Experiments go to show that with every slightest thought delicate recording apparatus attached to the body may reveal changes in thought through the changes in the tracings made by the apparatus. Even our æsthetic, emotional states in contemplating a work of art probably excite muscular adjustments which would be revealed if properly adjusted instruments could be applied to the body. Muscular adjustments are so closely interwoven with all mental activities that we are justified in saying that they are a part of the entire process which could not come to full fruition without them. Our ideas of space have been gained by muscular measurements, and when we think of space we cannot dissociate the muscular correlates from the totality of the idea-process. What would be our idea of skating without the various muscular accompaniments? A lecture on skating, even illustrated with pictorial representations, or, still better, with demonstrations of the process, would never give one a real idea of skating. Similarly, lectures on penmanship and drawing unaccompanied by muscular co-ordinations on the part of the child himself would never teach him how to write.

The only way to learn to write, is to write; to learn to saw boards, is to saw boards.

Some Fundamental Motor Concepts.—As the child learns the use of its arms, accomplishes the art of creeping, and the still more complex art of walking, his conceptions of space grow wonderfully. A child not allowed to creep or to walk is being deprived of a most fundamental birthright. Like all individuals who never travel, he remains provincial. These principles should receive abundant application in every-day education and in schoolroom practice. When pupils are learning the tables of denominate numbers, instead of going through mere word mouthings, they should be required to lift weights, and measure distances, areas, and volumes. An inch, a foot, a yard, a mile, an acre, a cubic foot, a cord should come to stand for definitely imaged realities. A boy who has sawed wood will not forget what a cord is, nor will one who has walked miles, and around and over acres, be dependent upon verbal memories for his knowledge of these units. If pupils are studying the table of wood measure they should actually measure piles of wood. My own knowledge of a cord of wood was made exceedingly tangible and vivid. Days and weeks at the wood-pile and in the forest chopping cord-wood, supplemented by loading and hauling the wood to market over rough roads gave me such a personal knowledge of every element in the problem that the ideas will be mine as long as time shall permit my brain and muscles to function. Not every boy, and still less every girl, has need of making wood measure so clear, real, and vivid, but the method of real learning therein illustrated is applicable to every subject. All ideas studied should be gained, as far as possible, through actual experience. The more nearly the experience grows out of life's activities and interests, the better.

If an idea of "sixteen ounces make one pound" is to be gained, the only real way is primarily by lifting or "hefting," and secondarily by seeing the relations. A knowledge of an inch, a rod, a mile, an acre can only be gained by actual personal measurement. I once visited a high-school class which

was studying the United States system of land survey. They were talking glibly about acres, sections, and square miles. Suspecting that their knowledge consisted of mere words, I asked: "How long would it take you to walk around a section of land?" "Fifteen minutes," was the instant reply of one pupil. My belief was confirmed, and I replied: "You must be a sprinter." The farmer boy's knowledge of acres is gained by following the plough up and down the furrows, day after day, fencing in an acre, ten acres, or fifty acres, mowing the hay, cradling the grain, binding the sheaves, even by grubbing out the trees and clearing the land. Of course acres are not the only concepts worth while knowing. It is quite probable that we might go through life ignorant of the concepts and be highly respected and intelligent, but we should have other concepts which are exactly as definite as the farmer boy's of acres, rods, and sections. The example illustrates the end and the means to be employed in gaining any kind of real knowledge.

The task of education has been considered too largely as one of instructing the child so that he may know *about* things. But a great part of a child's education should be concerned with teaching him to *do* things, to put into execution ideas understood, sometimes even to utilize ideas and processes which are vaguely or not at all understood. It is highly important that the child be able to stand well, to run easily, to sit properly, to breathe correctly, to sleep adequately and under hygienic conditions, to move gracefully, to close doors quietly, to avoid awkwardness, to be at ease in company. He cannot claim to be properly educated without having developed the habit of careful attention to health and personal appearance; unless he habitually observes good manners, habitually manifests politeness and all other signs of good breeding; not without regularly using the mother tongue easily, accurately, pleasantly, and forcefully. Along with these should be thoroughly acquired the habits of right moral responses and a cheerful, happy, altruistic attitude toward life's activities in general. All these come only after much prac-

tice, and they are imperfect until they become largely automatic. They must have become, not second nature, but primary nature. Along with his play the child should have the "work habit" thoroughly ingrained, and much of this work should be manual. Manual training in the schools and football and gymnasium exercises should supplement the motor training afforded by useful occupations and not supplant it.

The Laboratory.—Not only do our modern laboratory methods furnish sensory experiences, but also opportunities for motor accompaniments. Whole classes of ideas would be vague and incomplete without the knowledge furnished through the motor activities. The laboratory is not only a place for observing things, but also a place for doing and making, a place for *labor*—a "*labor-atory.*" The engineering student is obliged to make models, and to construct apparatus and machines. He is continually engaged in making, mapping, and charting, and where actual constructive representation is not possible or feasible, plans are drawn to scale, and in manifold ways, either primarily or secondarily, the muscles are employed in gaining, vivifying, and fixing ideas of realities. The modern medical student employs eye, ear, touch, and every sort of motor experience possible. Not only must he see and touch, but he must train himself to delicacy of measurement in locating various portions of the anatomy. Touch is not of the highest use when passive. Active touch refines exceedingly our passive tactile perceptions. Even the delicacy of visual perceptions are largely due to eye-movements. Students in all laboratory courses should be continually engaged in making, mapping, charting, and constructing.

Various Means of Motor Training.—In considering motor education it must not be overlooked that there are manifold forms of motor activity besides those connected with the *manual* arts. All activities which give control of the body and secure poise are important to cultivate. Even without possessing manual-training departments as such, the school possesses many opportunities for important motor training. Walking, standing, sitting, silence, orderliness, good manners,

politeness, all demand the development of motor habits. The plays and games can be turned to good account. Writing, drawing, map-making, constructing apparatus and setting it up, conducting experiments, all demand a high type of manual training. A musical education depends largely upon skill resulting from motor education. Apart from the rôle performed by the sensitized ear, musical skill is entirely a matter of training muscles to respond in delicate co-ordinations. Singing and playing any musical instrument require motor training of a high degree.

Motor Aspect of Language.—Every idea-process gets interwoven with a great variety of muscular co-ordinations, and among the most prominent are those involved in our use of language. The words and symbols are not only means of mental economy, expression, and of understanding others, but they become in reality a part of the ideational process. The idea could never have attained the same clearness without the use of words; in fact, full-fledged abstractions could not have been gained at all without the use of language, and they cannot be revived without employing language symbols. Consequently, in considering motor training we must not overlook these most refined of all motor relations between thought and language. There must be adequate opportunity for expressing ideas not only for the purpose of rendering the ideas permanent, but—equally important and more fundamental—for the purpose of making the ideas themselves clear and vivid. Real ideas are not something *added* to one's mind, but a *part of* the mind itself. Halleck says to speak of "motor ideas" is as tautological as to speak of "wet water." One of the scientific purposes of the recitation is to afford opportunity for expression. The recitation may demand oral expression, dramatization, written exercises, drawing, constructing apparatus, moulding, or some form of manual training. The motor activity serves not only to fix ideas, but also to clarify and enlarge them, and even to furnish new ideas. To abolish the recitation and depend entirely upon the absorptive process is to fail to utilize one of the most important means of education.

Vocal speech, for example, requires the nicest sort of motor adjustments, and the ability to talk fluently, accurately, and in a pleasing manner is no mean accomplishment. The possession of this ability implies accuracy and clearness of ideas as well as training in expression. Oral speech is often one's most valuable asset. It is usually the best index of what we know and what we are. No motor training is harder to acquire, rarer to be observed, and worthier of cultivation than perfect oral speech. Much time in the child's early life is occupied with acquiring speech. The process is largely one of subconscious imitation, but the results are no less certain and valuable than when gained through painful, conscious attention to the process. The child who hears correct language in the home is fortunate indeed. He is saved many painful hours of unlearning. The schools also are relieved of the burden of undoing undesirable habits. Language training in the lower school grades should be largely oral, and is a fundamental problem in motor adjustment. When teaching written expression, of course, the problem is also one of motor training, and even a most important kind of manual training. Learning a foreign language demands the acquisition of many motor adjustments. The memorizing of a vocabulary is for certain types of individuals very largely a task of motor memory. Acquiring accuracy and facility in speaking the foreign language is pre-eminently a motor task. To write it demands still other muscular training.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. How can you tell when a pupil knows his lesson? 2. How do you know the mental experiences of another person? 3. In what sense is education a matter of training the nervous and muscular systems? 4. In what sense is education a matter of selecting stimuli so as to secure certain responses? 5. Give an illustration of "education by doing," in arithmetic, writing, history, civics, driving an automobile. 6. Suggest ways in which the school could afford more opportunities for education by doing. 7. What relation is there between motor training and race intelligence? 8. Apply the idea of education by doing to the training of defectives. 9. Distinguish between motor education and manual training. 10. Do farmer boys need motor training? Why?

References for Further Reading

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3. Colvin and Bagley, *Human Behavior*. Entire book.
4. Dewey, *Schools of To-morrow*, chap. VI.
5. Parker, *Methods of Teaching in High Schools*, chap. VI, XI.
6. Watson, *Psychology from the Standpoint of a Behaviorist*, chaps. VIII, IX, X.
7. Watson, *Suggestions of Modern Science Concerning Education*, chap. II.
8. Woodworth, *Psychology: A Study of Mental Life*, chaps. I, III, IV, V.

CHAPTER VIII

FUNDAMENTAL ACQUISITIONS: SENSE-PERCEPTIONS

"All Knowledge Takes Its Rise in the Senses."—This expression was stated and emphasized by Comenius long ago, but even now we have hardly awakened to its importance. There are many teachers still who proceed as if they believe that all knowledge comes through words. There are those who try to have pupils get meaning from reading words for which the pupils have no background of sensory experience, and then they wonder why pupils read so poorly and with so little understanding. There are those also who teach geography as a matter of definitions and book descriptions, who teach physics without laboratory or experiments, who have pupils read about chemical action instead of producing it and observing it, who try to teach civics by requiring pupils to memorize the constitution verbatim without ever witnessing a concrete illustration of its workings.

Necessity of Direct Experience.—To show strikingly how important the education of a sense is, we may refer to cases where persons have been blind and have later received the power of sight through an operation. A boy who had thus been made to see was shown the pet cat with which he was so familiar. He stared at it in amazement, without being able to comprehend. Finally he took hold of the cat and felt her all over while looking at her. He gained a new idea entirely, and said: "Now, kitty, after this I shall be able to know you when I see you." Ziehen gives an illustration which shows that modes of perceiving become so persistent that it may even be impossible to establish the mode "natural" to normal persons. He writes:

A certain individual, who had been born blind, was unable to form any idea of a square, even upon seeing it after his sight had been restored by an operation, until he began to perceive a sensation in the

tips of his fingers, as though he were really engaged in touching the object at which he was looking. The patient had constant recourse to his sense of touch, just as the normal man resorts to his sense of sight in the recognition of objects. (*Introduction to Physiological Psychology*, p. 87.)

A similar case was reported by Doctor Miner from the psychological laboratory of the state University of Iowa. It is probably the best study on record of such cases. The subject, Miss W., had complete cataracts in both eyes, and was reported as blind from birth. At twenty-two both cataracts were removed by Doctor L. W. Dean, professor of ophthalmology in the University of Iowa. She had received a high-school education in the state School for the Blind. Doctor Miner's investigations were conducted nearly three years after sight was restored to the right eye, and nearly two years after the operation on the left eye. Among other tests, Doctor Miner made a careful study of her stock of visual knowledge, and her mode of acquiring visual ideas. Even then she was found very deficient in these respects. In Doctor Miner's words:

Miss W. was still completely naïve to many of the normal visual experiences of an adult. She had never looked through a stereoscope, opera-glass, field-glass, or telescope. She had never used both eyes together enough to find out any differences between monocular and binocular vision. She had not yet learned to translate her visual images into terms of movement with any degree of success, except in case of the most simple forms and numbers, or with common objects of her previous touch experience. She knew practically nothing about drawings or pictures. She had not even learned to identify people by their faces; those whom she thought she knew by their features were her mother, father, sister, a teacher at the school, and the nurse who was with her during the operation. Although I worked with her every day for over a month, and she saw Doctor Dean often, I believe she cannot recognize either of us by sight. Miner, J. B., "A Case of Vision Acquired in Adult Life," *Psychological Review*, Monograph Supplement, March, 1905.

She recognized persons mainly by the sound of the voice. She possessed an "all-powerful impulse to explain anything new by referring it at once to the language of her sightless

experience." In counting the sides of a hexagon, for example, she used some sort of muscular movement to register each number. "She would tap with her fingers, or foot, press her teeth together, or her tongue against her teeth, move her head, regulate her breathing, or even slightly wink at each corner, in order to register that as number one before passing to the next." For a long time shadows seemed like real objects to her, and she often walked around them. Because she could not judge distances accurately, she frequently upset dishes on the table. In learning through reading or hearing, she repeated everything to herself, translating everything into motor terms.

If a child is blind from birth it is therefore deprived of a class of experiences which can never be acquired through any other means. Stop the ears of the same child and another gateway of the soul is closed. Suppose the same child is deprived of the senses of taste, of smell, of temperature, of weight, of direction, of touch—and all the rest. All of the gateways to the soul are closed and the child grows up mindless—an idiot. Each sense supplies the mind with information of its own particular sort. The eye is fitted to respond to waves of light, the ear to waves of sound, and no other part of the body can act as a substitute. The eye is dead to waves of sound, the ear to light, and the sense of touch does not respond to odors. One who is deprived of a single sense, or who is defective in that sense, is caused to limp mentally just as surely as one must limp when a leg is amputated. Helen Keller has never really known color. She knows nothing of the melodies of sounds in nature as we who hear know of them. It should be remembered, also, that exercise of the senses must be secured at the right time. If early life passes without ample opportunity for sensory exercise, arrested development ensues, almost as disastrous as if the centres had been destroyed.

Earliest Sensory Experiences.—The moment the child is ushered into the world its sensory experiences begin. By force of circumstances the child receives innumerable stimu-

lations through light, sound-waves, and physical contact. Myriads of stimuli come to the child unsought, many undesired and many undesirable. So James said: "The world presents itself to the child as one big, buzzing, blooming confusion!"

The percepts thus slowly gained are indispensable to further higher attainments. The ear that is closed, the eye that is blinded, is not only lost as an avenue of knowledge, but the mind of the possessor is circumscribed and dwarfed because lacking certain fundamental kinds of knowledge. The congenitally blind can never know color, though they learn its entire nomenclature; their knowledge of form, size, and perspective is circumscribed, while they can never know complex things as wholes as the seeing do. The deaf have no concept of sound—only word ideas about it.

As soon as a child creeps he begins to get ideas of an extended environment. With walking he is put in possession of a means of exploring an enlarged world. During the early years the child should come into direct personal contact with a large range of objects. The field, forest, and mountain should all be explored and examined. He should literally and figuratively leave no stone unturned in his investigations and explorations. What nonsense first to study steam-engines, telegraphs, plants, animals, birds, and rocks from books! The only excuse for book study at all is that we may study things not accessible and that we may be enabled in advanced stages to study the object to advantage. Darwin's epoch-making contributions could never have appeared had he not examined at first hand a large part of the material mentioned. No progress in any line of science or art is ever made by those who have not an observational knowledge of the objects of their search. The astronomer sweeps the heavens with his eye, bringing to the aid of his limited vision distance-annihilating telescopes, and the biologist searches in the laboratory with eyes made a thousand times acuter by the microscope. "Aristotle knew the importance of asking nature for facts, and he induced his royal pupil, Alexander the Great, to em-

ploy 2,000 persons in Europe, Asia, and Africa for the purpose of gathering information concerning beasts, birds, and reptiles, whereby he was enabled to write fifty volumes upon animated nature. After teachers had forgotten his methods they still turned to his books for the treasures which he had gathered." (Schaeffer, *Thinking and Learning to Think*, p. 61.)

Meaning of Training.—The main thing in early sensory training is exposure to the big world of things and guidance in what to observe. Training should not degenerate into formal gymnastics. The conscious aim of the teacher should be not to train the powers but to use them intelligently in acquiring knowledge. To have just so much seeing, so much hearing, so much smelling, so much tasting, and so much finger-bending each day is the sheerest nonsense.

The training begun before school-days should not be abandoned on entering school. Increased opportunity for more extended observations should be afforded. The training should become more intentional, more definite things should be seen, and descriptions, at first oral, of what is seen should daily become more accurate; though indefiniteness, vagueness, naïveté must be expected through many years. A great variety of things must be brought to the child, when impossible to take the child to them. That is, specimens, samples, pictures of the great, busy world should be collected into museums, cabinets, and laboratories, where children may learn of nature, art, industries, marts of trade, commerce, shipping, mining, etc. A chance to see and examine the local region under competent guidance should be afforded every child. For, unfortunately, the pupil often first becomes acquainted with his home locality through reading. The knowledge thus acquired never possesses the vividness and interest that real personal acquaintance gives its possessor. Field, forest, and stream should be explored and importuned to yield their secrets. The children should, like Shakespeare's Duke, find "tongues in trees, books in running brooks, sermons in stones, and good in everything."

Objective Teaching.—Objective illustration is necessary because "all knowledge takes its rise in the senses." Objective illustrations should be given *whenever the elemental ideas in any topic are not easily understood through imagination and reflection.* Their necessity is as great in the university as in the primary school. In the words of Doctor White, "the primary ideas should be taught objectively in all grades of school." The meaning of *primary* or *elemental* ideas needs to be understood. The mind can image any material or any combination of material things, provided the elements have been derived through perception. Once transcend experience of the elements and blankness results. As the congenitally blind cannot image a color, nor the congenitally deaf music, a normal pupil cannot image a machine unless he has actually seen it. Object-lessons are as much a part of reading lessons as of chemistry. Whenever fundamentals are lacking through experience they should, if possible, be supplied by objective illustration or pictorial representation.

A caution needs to be offered against too prolonged continuation of the objects. Just as soon as sensory experience has been made clear, the object is no longer needed. In fact, its continuance will be positively harmful. Sensory experience is the lowest form of knowledge, and is only the raw material for a finer web of thought. Dealing with sensory experience when the child should be reflecting will surely produce arrested development. As Doctor Hinsdale has so well said:

> The Realists have deservedly emphasized the value of sense-perception and of sense-teaching in education; but they have not emphasized the facts that the particular and the concrete mark an early and imperfect stage of mental advancement, and that there is no greater clog upon mental progress than the habit of "*thinging*" *it*, and that a man's thinking capacity is gauged by his power to think general and abstract thoughts. Children and savages—all immature minds—live in their senses; cultivated men grow out of them. . . . The savage is as weak in speculative reflection as he is strong in keenness of scent. . . .

In gaining ideas of number, the child must derive his first notions through actual experiences with concrete things. He

must learn through actual experiences the relative magnitude of numbers, the magnitude of number series, and in the same way secure a correct idea of the process involved in the various computations. In teaching arithmetic it is so easy to contrive means of affording sensory experiences and of making things concrete. All measures of length, area, volume, weight, and capacity can be readily objectified. Unless gained concretely, they never mean anything. Children may recite glibly tables of denominate numbers and not have a single definite notion of what they are mouthing. But it is pedagogically unwise to have the pupil learn every fact and every subject objectively. For example, $3 + 2$ or 3×2 may be learned objectively, but $9 + 8$ or 9×8 never should be. These latter should be taken as authoritative statements, unquestioningly. Who knows from objective experience that $9 \times 8 = 72$? Whoever first learned it that way is to be pitied. The child knows from counting that eight 9's are more than seven 9's, and also knows from counting the relative places of 63 and 72, so that when $9 \times 8 = 72$ is told him it seems reasonable. If the table were built up rationally, step by step, he would not believe that $9 \times 8 = 14$, but he could easily be made to believe that it equals 73. Many things that we never demonstrate nevertheless fit into our rational thinking, so as to do no violence to the usual currents of thought.

Doctor Schaeffer instances a school in which the principal proposed concrete work in fractions.

> The teachers and pupils began to divide things into halves, and thirds, and fourths, and sixths. They added and subtracted by subdividing these into fractions that denoted equal parts of a unit. Whilst the charm of novelty still clung to the process, a stranger who visited the school asked one of the teachers how the pupils and parents liked the change. "Everybody is delighted," was the exclamation. A year later the same teacher was asked by the visitor: "How are you succeeding with your concrete work in fractions?" With a dejected air she replied: "We are disappointed with the results." "Just as I expected," exclaimed the visitor, "for you were making the children think on the level of barbarism, instead of teaching them to use the

tools of labor-saving machinery of modern civilization." (*Thinking and Learning to Think*, p. 91.)

As far as possible, object-lessons should be given in their natural setting. The object-lesson, apart from a life interest, does not compare with one that grows out of a consideration of things in their natural surroundings, and studied as a part of everyday life. Dewey may be quoted apropos of this point (*The School and Society*, p. 8):

No number of object-lessons, got up as object-lessons for the sake of giving information, can afford even the shadow of a substitute for acquaintance with the plants and animals of the farm and garden, acquired through actual living among them and caring for them. No training of sense-organs in school, introduced for the sake of training, can begin to compete with the alertness and fulness of sense-life that comes through daily intimacy and interest in familiar occupations.

The material sciences are not the only ones that demand laboratory methods. The schoolroom with apparatus is not the only real laboratory. The schoolroom laboratory, in fact, is only a miniature, controllable representation of certain fundamental laws or facts of the great laboratories of nature and of life. Teachers of science should vitalize their work by utilizing these greater laboratories, by affording opportunities to inspect them, and by continually showing the applications of all laws and principles in everyday life. In fact, applications are more apt to interest than are the detached illustrations.

Field Trips.—In Europe the school journey is a unique and valuable means of making instruction real. Not only are brief excursions made frequently into the immediate locality, but many schools make periodical journeys lasting from three to six days. In the former the pupils become thoroughly conversant with the points of geographic and historic interest and with the life about them. This gives an apperceiving background for the things not accessible. How many of us have studied the botany of rare plants and been ignorant of dozens of common species within a stone's throw of our door, or have studied rare rock formations from a book when an hour's

tramp would have made every point tangible! The longer journey may not be feasible in a sparsely settled region, but in New England and in some other parts of the United States it could be carried out to good advantage.

Relation of Books to Sensory Experiences.—One of the commonest mistakes is to make teaching simply a matter of words. From the very fact that schools have properly so much to do with books, it is easy to regard teaching as a mere matter of memorizing the words of books. It should be remembered that books do not deal directly with realities. They only contain records about realities. The realities must be acquired through personal examination of the realities themselves. Text-books must be regarded as texts; the sermons must come from outside sources. To be sure, books should serve to reveal knowledge which one might not get so readily or not at all by studying realities alone; but they can only do this when they constantly appeal to experiences realized. This is true of the knowledge of a dynamo, a potato, or a rock; it is also true of a psychological fact or a philosophical theory. The dynamo is only known when it has been made real and is comprehended through experience; likewise one knows nothing of a psychological law until he has realized it through his own personal experience. "Not psychology but to psychologize" should be the end sought in that study.

The teacher should scrutinize every step in every subject and inquire: "How can I cause the boys and girls really to know this step?" If this were done in every schoolroom in the land, the educational millennium would soon appear on the horizon. Dewey wrote: "What is primarily required is first-hand experience. Until recently the school has literally been dressed out with hand-me-down garments, with intellectual suits which other people have worn." And we might add that, like all borrowed garments, they are usually misfits.

When I was in high school we studied physics by the book method. Not a single piece of apparatus did the school possess—much less a laboratory. Not a pupil in the class performed an experiment, nor did the teacher. The nearest ap-

proach to the study of realities was through the good diagrams and pictures in the text and the diagram occasionally drawn on the blackboard. Astronomy, zoology, and geology were studied in the same school and by the same barren verbal method. I think chemistry was also studied. Had there been real chemicals and an occasional explosion I am sure that I should remember the fumes and the explosions. Later pursuit of this subject in a real laboratory left me a very definite remembrance of the nature of chemistry. In the study of botany we fortunately had a teacher fresh from a university, and we studied real, live, growing plants. Unfortunately the main end seemed to be names and classifications, but in spite of that we handled plants, tramped through swamps and over hills, tore our clothes in the thickets of brush, and discovered where the plants grew, when they grew, and how they grew. These impressions will always remain. Time and distance and other impressions cannot efface them. They were my own personal experiences, my own ideas and not Gray's nor Apgar's nor my teacher's. They are mine still.

An acquaintance of mine relates that when a boy, back in Ohio, one day when they were studying the animals of the Rocky Mountains an itinerant bear-trainer, with three Rocky Mountain bears, passed that way and stopped in front of the old log schoolhouse. Here was a grand chance to let the children see the real thing. What did that teacher do? True to her training and ambition as a strict disciplinarian, and true to her ideal that book learning was the school, she sternly ordered all to cease looking out of the windows, even rapped some on the head, and commanded: "Study your books!" Recently a teacher told me apologetically that when Barnum and Bailey's circus and menagerie was in the city she allowed the children a quarter-holiday, and added still more apologetically: "I really think they learned almost as much as if they had stayed in school." My answer was: "Why, bless you, they learned more in that quarter-day about animals and many wonders of the world than your school could have given them in ten years! In fact, the

knowledge they gained there you could not give them at all. By all means dismiss school every time a great circus and hippodrome is within reach of the children. The menagerie will furnish your boys and girls geography, natural history, and language lessons, such as no school on earth can give."

The School of Life.—We must not assume that the child secures all his education within the four walls of a schoolroom and from his text-books. The whole of life is education. The school should be the best interpreter of life and should furnish more tools than any other source for the work of life, yet many, if not the most important, educational lessons must come from outside the school. The extent of the child's extra-school experience determines the manner in which he shall appreciate what we attempt to teach him. Years before the child knocks at the schoolhouse door, and during his school age for many more days and hours than he is conning his lessons, he is acquiring by nature's method more and better than we usually teach him. In "The Barefoot Boy," Whittier has beautifully expressed a profound educational idea and shown us how independence of thought should be acquired, and that life is the greatest school. He praises the boy for his

"Knowledge never learned of schools,
Of the wild bee's morning chase,
Of the wild flower's time and place,
Flight of fowl and habitude
Of the tenants of the wood;
How the tortoise bears his shell,
How the woodchuck digs his cell,
And the ground-mole sinks his well;
How the robin feeds her young,
How the oriole's nest is hung;
Where the whitest lilies blow,
Where the freshest berries grow,
Where the ground-nut trails its vine,
Where the wood-grape's clusters shine;
Of the black wasp's cunning way,
Mason of his walls of clay,
And the architectural plans
Of gray hornet artisans!

> For, eschewing books and tasks,
> Nature answers all he asks;
> Hand in hand with her he walks,
> Face to face with her he talks."

Halleck remarks that "if the child's knowledge reaches to a solid foundation of sense-training like this, the floods of time will beat in vain upon that knowledge. Other things may pass away, but that remains while the brain lasts." He argues at great length that country environment has proven most conducive to the development of great intellects. He cites in proof of his contention the names of Shakespeare, Milton, Cromwell, Addison, Bunyan, Dryden, Johnson, Byron, Longfellow; and many others who were illustrious and who were profoundly influenced by rural environment. (*Education of the Central Nervous System*, p. 92.) Country environment is undoubtedly conducive to the child's best mental development; first, because it furnishes stimuli which are simple and comprehensible at that stage of development; second, because there is also greater opportunity for freedom, thus allowing the child to follow lines of interest; and, third, because his growth is not forced. The city is too complex, too intricate, and too much like a hothouse.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. How did you get your ideas of the following terms: hard, sour, hydrogen sulphide, livid, lurid, translucent, sundae, pellucid? 2. Are the blind good spellers on the typewriter? 3. What senses are most directly used in learning to drive an automobile? 4. If children become expert in perceiving colors, are they therefore keener in perceiving tones? 5. What senses are of dominant use in learning music? spelling? 6. Should oral spelling be encouraged? 7. Should the senses of taste and smell be trained? 8. What relation is there between sensory experiences and algebra? philosophy?

References for Further Reading

1. Bolton, *Principles of Education*, chap. XVII.
2. Colvin, *The Learning Process*, chaps. V, VI.
3. Cameron, *Psychology and the School*, chap. V.
4. Dewey, *The School and Society*, chap. II.
5. Hall, *Aspects of Child Life and Education*, pp. 1–52.
6. James, *Talks to Teachers on Psychology and Life's Ideals*, chaps. XIII, XIV.

CHAPTER IX

LEARNING AND EXPRESSION THROUGH PLAY

Play Reveals Child Nature.—If one wishes to understand child nature there is no other means so illuminating as to watch children at their spontaneous plays. The child at his school tasks is apt to be artificial and reserved. This is especially true in the recitation, where he knows that everything he says and does will be watched and probably marked. Under such circumstances he refrains from expression as much as possible. But at play he is himself, and his inmost thoughts, feelings, and attitudes are expressed spontaneously and unrestrained.

Every teacher should be obliged to spend some time on the playground with the children, first because of the splendid opportunity for knowing children as they are; second, because of the unexampled chance to influence them; and third, because of the reflex effect upon the teacher. Participation in the children's plays will be as a fountain of youth, will cheer and sweeten the life of the teacher, help him to love children and to delight in being their companion and guide. The teacher who actually participates in the children's plays gains a hold upon them that is not enjoyed by the mere taskmaster. The teacher in the high school who wields the greatest influence of any in the entire school system is the athletic coach. His influence is for weal or woe, according to his innermost character.

In colonial times and much later, play was considered by many as sinful, and it was the business of teachers to keep the children from playing. My own early teachers apparently believed it implicitly and obeyed it faithfully. Happily, now, our whole interpretation of play life has changed. We know that play is the most spontaneous and natural expression of

child life. Not only is play now allowed, it is encouraged; children are furnished playgrounds and gymnasiums, have time set apart in the school programme for play, and are even taught how to play.

Plato said: "The plays of children have the mightiest influence on the maintenance of laws—from the first years of childhood their plays ought to be subject to laws, for if they are arbitrary and lawless, how can children ever become virtuous men, abiding by law?" Aristotle advised that children before five years of age "should be taught nothing lest it hinder growth, but should be accustomed to use much motion—and this can be acquired by various means, among others by play, which ought to be neither too illiberal, nor too laborious, nor lazy." Luther tells us that "Solomon did not prohibit scholars from play at the proper time. A young man shut up (without recreation) is like a young tree which ought to bear fruit but is planted in a pot."

Locke asserts that "the gamesome humor of childhood, which is wisely adapted by nature to its age and temper, should be encouraged, to keep up their spirits and improve their health and strength. The chief art is to make all that children have to do, sport and play." He invented games for teaching reading, and suggested others. Richter in the *Levana* says that "activity alone can bring and hold serenity and happiness. Unlike our games, the plays of children are the expressions of serious activity, although in light, airy dress. Play is the first poetical (creative) utterance of man." Schiller says: "Man is man only when he plays."

Finally Froebel, in the *Education of Man*, says:

Play is the highest phase of the child development—for it is self-attentive representation of the inner life from inner necessity and impulse. Play is the purest, most spiritual activity of man, at this stage, and at the same time typical of human life as a whole—of the inner, hidden, natural life in man and all things. It gives joy, freedom, contentment, inner and outer rest, peace with the world. It holds the sources of all that is good. A child that plays thoroughly, with self-active determination, will surely be a thorough, determined man, capable of self-sacrifice for the promotion of the welfare of him-

self and others. The spontaneous play of the child discloses the future inner life of the man. If the child is injured at this period, if the germinal leaves of the future tree of his life are marred at this time, he will only with the greatest difficulty and the utmost effort grow into strong manhood. (Quoted from Tanner, *The Child: His Thinking, Feeling and Doing*, p. 393.)

What Is Play ?—It is not easy to define play nor to distinguish absolutely between play and work. However, in play there must be spontaneous expression prompted by a feeling of vigor. *Through* play there must result a feeling of satisfaction *through* the activity itself. In play there must be a sense of relaxation. The significant factor in play is the mental attitude, and not the physical activity connected with it.

We are apt to think immediately of physical activity, a gymnasium or a playground and a game. While all these may be connected with play, yet play has a much broader significance. While physical culture and physical health are desirable outcomes of play, yet they are not the essential features of it. Since exhilaration and spontaneity are the chief characteristics of play, it is possible that a game involving a severe physical contest may be the hardest kind of drudgery and be devoid of the play attitude. Games requiring physical endurance and skill are to be encouraged, but their purpose is the development of strength, skill, endurance, or poise, and they do not fill the demand for play. The hard-worked and oftentimes overtaxed athlete must find his play in other forms of activity, which will afford spontaneous recreation.

The great majority of play directors think of play only in connection with games and physical contests. In their direction of play fields they think only of the organized games. It is, of course, desirable that organized games should be promoted, but much of the best play is unorganized and haphazard. The children who throw a ball, then try the giant stride, as quickly turn to climb a ladder, or change to chase a butterfly, are really playing, and the ones in the prescribed

games may be working. The player must be free to cease playing or change the type the moment his interest flags. The organized games are valuable and may be play, but are not necessarily such.

Judged by the foregoing criteria, it will be seen readily that real play must spring from inner impulses rather than to be required from without. Oftentimes the game ceases to be play because of external requirements and because it is carried beyond the point of relaxation and rejuvenation. It is well to have play guided, but not prescribed.

Play Is Instinctive.—All normal children play. The child that does not play is undoubtedly mentally abnormal or ill. Not only do children play but adults do also, if they have lived naturally through the period of childhood. A great many animals, especially the young, engage in play. Play seems to be a natural means of relaxation. To assume that play is instinctive does not mean that the particular form of play is instinctive, although in some cases it may be. It has been shown by some writers that the great majority of plays and games are an outgrowth of and a modification of running, throwing, hiding, caring for children (as in doll plays).

Patrick says the child "plays because he is a child, and to the child's natural and active life we give the name 'play' to distinguish it from the life of conscious self-direction, of strain and effort and inhibition which evolution has imposed upon the adult human being." (Patrick, G. T. W., *Psychology of Relaxation*, p. 79.) Play in the case of adults, the same writer holds, is a turning away, a relaxation from the serious work of life, which means tension, strain, and inhibitions. The forms of play of the adult follow in large part the same essential directions as those of children. The main differences are in the numbers of rules and complexities.

Play Is Mental Relaxation.—With the foregoing idea of play in mind it will be readily seen that there are many forms of play. Games of checkers, chess, or cards, when engaged in for pastime and recreation and not as a serious business, are a means of play. Billiards and pool are in the same category.

Then there are theatres, concerts, and movies that are to be included in play. In these the real players are not the actors on the stage, but rather the ones who go to be entertained. They go as a matter of enjoyment, do little or no serious thinking while there, forget the cares and routine of the day, and come away refreshed. At the football contest or at the great American League games the real players are not the contestants on the gridiron or the baseball diamond—they are working furiously—but rather the ones who sit on the bleachers and yell themselves hoarse. They are there to get away from routine, to watch others struggle, to give way to their moods and emotions, to secure relaxation. In the same attitude we go to the circus. Those with the organization go through their acrobatics and various stunts, not as relaxation, but as a matter of earning their daily bread. We onlookers give ourselves up to the enjoyment of the day and the change, the excitement, and the keen pleasure that acts as an electric charge from a battery, giving us rejuvenation and tonicity. That is characteristic of all real play. Its value is peculiarly enhanced if the play is mirthful, causing us to laugh. Every one knows the tonic effect of the hearty laugh. "Laugh and grow fat" is a world-old dictum.

The play aspect of reading has not been recognized sufficiently. Very few writers have mentioned it. However, it is one of the most important play activities of millions of people, adults as well as children. Reading frequently for the pure fun of it should be encouraged heartily. Serious reading should have its place also. But people need to learn to find the keenest pleasure in reading. They need to have the opportunity, and to acquire the habit of reading just for the enjoyment that is to be got out of it. For the moment, they allow some one else to do the thinking, and give themselves up to the flights of fancy, to day-dreams, and to ideals which attract, possibly amuse; at any rate, so compel attention that they draw us entirely away from serious work and routine, and possible drudgery. Such attitudes, occasionally interspersed in the midst of work, are absolutely essential to a well-

balanced education. They produce a reflex effect upon all the rest of life, promoting normal healthy development, sanity, and poise of mind. The insane are generally persons who have drifted entirely away from a normal play-life. Many insane never had a play period in childhood and never learned to play.

The Varied Values of Play.—The values of play are as varied as the values of life. The physical, mental, social, moral, and religious natures all owe their debt to play. It is difficult to overestimate this debt. Play is the school of infancy and childhood, without whose tutelage formal education could accomplish little. Preyer, from his intensive study of infancy, was convinced that a child learns as much in his first three or four years as in his whole university course. The time has passed when with our Puritan fathers we can look upon play as a waste of time. Rather it is the child who does not play whose time is wasted. Many books and special articles have recently been written to demonstrate the values of play. We can here barely indicate these values.

The recuperative, diversional, and relaxational values of play have already been suggested. If there were no other values than these, play would deserve a large place in the life of youth and of adults, and would find ample justification in the scheme of life. The greater the stress and strain of work, the greater the need of the relaxation which play most surely furnishes. Sorrow, depression, painful associations, and distressing circumstances are forgotten, and their detrimental effects are at least diminished by play as by nothing else. The fatigue incident to the deadening routine of many present-day occupations finds here its safest antidote. Active plays and games increase the vasomotor reactions, stir to action the healthful emotions which always accompany spontaneous activity, rid the body of the accumulated toxins generated by drudgery, and so recuperate and revitalize the body and mind. Play is an antidote to vice as well. Many a worker at narrow, circumscribed, and distasteful tasks may

be saved from resort to alcohol, narcotics, drugs, and other harmful stimulants by being taught to find relaxation, diversion, and stimulation in proper physical play.

Plays and games form character and mould the soul in varied and most effective ways. There is scarcely a virtue that is not born and reared to sturdy strength through suitable and timely play. Self-control, self-reliance, self-subordination, co-operation, loyalty, self-assertion, self-direction, capacity to lead and willingness to follow, are necessary virtues learned nowhere so readily and so surely. Justice, honesty, respect for the rights of others, the necessity for and the binding nature of law, and all those principles, recognition of which complex social and industrial life demands, come as by-products of rightly conducted play. Dramatization and imitation of adult activities give the best insight into the duties and responsibilities of citizenship and train them far better than mere instruction. Hall's *Story of a Sand Pile* is an excellent illustration of the varied and specific ways in which play under favorable conditions may prepare for citizenship by giving suitable practice to its essential activities.

Play in Physical Education.—There are two main reasons why play should be encouraged as a means of physical education. In the first place, since real play is so interesting, it is easy to secure physical exercise without compulsion. To go through physical exercise just as prescribed activity soon becomes monotonous, and few voluntarily keep up such exercise for any length of time. To walk, to run, to row, or to lift dumb-bells just as a periodic means of exercise requires more than the ordinary amount of will-power even on the part of adults. But if there is something of interest to be seen when walking or rowing, if one has interesting companions, if one goes through an interesting competition with the dumb-bells—in short, if the end is interesting in itself, the means will be followed. This games and sports may easily and naturally provide. Therefore, there is no more simple and efficient means of securing needful physical exercise than through games and sports. Accomplishment of an end always has

been and always should be the motive for action; exercise, physical and mental, should be incidental outcomes.

A second valid reason why play is necessary to encourage physical exercise is that the old forms of physical exercise through work are largely impossible now. Curtis says (*Education through Play*, p. 21):

When I was a boy, I got most of my physical strength that I have to-day on the wood-pile. But we have no wood-pile in the modern city. In preceding ages children, before their growth was completed, have always helped in many of the activities of their parents. To-day the factory system and our doctrine and laws concerning child labor prohibit the work of children. But even so far as they participate in the occupations that are available and in child labor, so called, these do not mean physical development. A boy will never become an athlete from standing at a loom in a cotton factory or from shucking oysters, or delivering packages, or tying bundles, or picking berries. On the farm, too, there has come an almost complete change. The wheat is cut and bound with the binder; the hay is cut with the mower, raked and loaded with the loader, and unloaded with the hay-fork. Nearly all the work is done by horses and a machine which the boy rides. There has not been so great a change in the work of the home, but a girl cannot develop a perfect physique through washing dishes, making beds, and sweeping. These activities are about the worst exercise that there is in the whole calendar, are indoors, and tend to fill the lungs with dust. Schmidt says that the death-rate from tuberculosis is 25 per cent higher among girls in the public schools of Germany than it is among the boys. This is just what we should expect. The work of the girls in the home, while it is less in amount, is of much the same kind as it always was, but the girls for the last fifty years have been getting less and less of outdoor exercise, and it is this that has always been the main source of their strength.

While there is little physical development to be found in the tasks that are available for city children, up to about 14, almost none of them are doing anything. Go where you will about our cities and you will find that, outside of a few boys who are carrying papers or shining shoes, the boys are loafing, not working.

The only means there is left whereby a child may become strong is through his play. But if he is to get his physical development in this way, he must have vigorous play; he cannot do it at ping-pong and marbles. The children who are playing tag and similar games on the street, and roller-skating, will develop their legs, and through them their hearts and lungs to a considerable extent, but there is little in

street play, except fighting, to develop the muscles of the arms and shoulders, and back and chest.

Social Value of Play.—Since character is mainly determined by actions which are a result of free choice on the part of an individual, play is one of the most effective means of fashioning character. If play is supervised so as to suggest and stimulate organization, it furnishes a splendid natural opportunity for social development. If overdirected and prescribed, the opportunity is largely lost. Merely being in groups and following regulations is not necessarily social. It is group activity, but does not represent group initiative and planning. For an action to be truly social, it must be initiated by the group, must represent group decision and group persistence. The organization must be representative of the group and for the group and be executed by the will of the group. Too often play directors take away all these opportunities and possibilities by ready-made overorganization and prescription. As far as possible, children themselves should develop the rules of the games.

Of course it may require considerable stimulation and guidance to get the pupils to organize games among themselves. The younger children will constantly transgress the rules, if at all complex. Even boys of a dozen years of age do not hang together in organized groups for any length of time. They often organize a baseball team early in the season, but they do not hang together through the season. This is suggestive that we should not expect too much in the way of organization among children, nor should we prescribe organization that is too complex or that requires long continuation of the same game.

Organizations initiated and developed by the older pupils themselves in promoting their various sports are a very excellent means of developing real social responsibility. While there should be oversight and general supervision by teachers of athletics and other sports, the high-school pupils themselves should be mainly responsible for the clean organization

and conduct of all such activities. Whenever they do not live up to their responsibilities, the privilege should be withdrawn. Knowing this, they will usually respond manfully.

In this chapter no attempt will be made to indicate any specific plays that are suitable for the various stages of development. In this discussion only the psychology of play and the fundamental educational principles growing out of it have been considered. There are many excellent books and manuals on play which teachers and directors can follow.

Opportunity for Play.—The educational value of play is just beginning to be realized. It already has a large place in the school activities from the kindergarten through the university. Unfortunately there are two serious defects in its use. First there is not opportunity to play provided for all; second, where play is secured it becomes overorganized and often too strenuous. Play is quite generally a part of the kindergarten programme, but it is too frequently so highly organized as to lose much of the values that come from more simple and spontaneous play. In the elementary and intermediate school play facilities are almost wholly lacking in most schools. There the pupils are at the age when they need play most. In the grammar-schools, where play is encouraged, it is apt to be for the boys mainly, and for them it is apt to be patterned after the strenuous games and contests of the high school.

Many authorities seem to think that they have provided quite adequately for play in the high school. They consider that the gymnasiums for formal corrective exercises and the permission to develop a football team accomplishes this end completely. Much of the gymnasium exercise is not at all in the nature of genuine play. Its purpose is to produce coordination and control. The exercises are systematically arranged and look toward a definite end. The exercises usually demand as specific, continuous, and sustained attention as other work in mathematics, language, or science. Ask the pupils if their gymnasium exercises are play or work, and they almost universally answer "work!" They were originally de-

signed to take the place of work which the farmer's boys and girls secured through their regular duties, but which city life made impossible. Now the farmer boy who works hard and gets plenty of exercise needs play as well as the city boy, who does not have the advantage of real physical work.

In the high schools and colleges, while games are numerous, the very individuals who need the exercise do not secure it. Only those who have the physique to be probable winners in the games are given even an opportunity to participate. Almost no provision has been made for plays and games for all. That should be one of the next steps in the new education.

It is very important for the public to provide opportunities for recreation for all the people. This is especially necessary since life has become so tense in carrying on business and in the face of such complex social, industrial, and political conditions. Municipalities are very properly establishing and maintaining parks, public play-fields, and various kinds of amusement facilities. If people are to retain their poise, it is absolutely necessary that they have adequate opportunity for relaxation from the routine of everyday business cares and worries.

The construction and proper maintenance of modern automobile roadways leading to all the farms and penetrating the national forests, winding up the mountain canyons and skirting the lakes and ocean shores are not only a far-sighted financial investment but a contribution to the bettered health, sanity, and education of our people. The automobile, usually thought of as a luxury, is a necessity for rich and poor alike. It has broadened the mental horizon, quieted the frazzled nerves, restored good humor, and educated millions of the toiling masses. It is a natural play promoter as well as a great business asset.

All our schools should be provided with adequate playground space so that all pupils would have opportunity for outdoor recreation. In addition to this, there should be a gymnasium and swimming-pool in connection with every school. Of course isolated one-room rural schools could not

be thus equipped. But soon the one-room country school will be largely displaced by the consolidated school having several rooms and modern equipment and accessories.

Playtime should be as carefully set apart as study, recitation, and laboratory periods. Some teacher in the corps should have charge of the play activities, meeting different groups at different times. In this way the play space will be economized and opportunities will be provided for all children to participate. As previously suggested, abundant opportunity must be provided for real free play. Some of the time may be devoted to games and definite exercises, but these must not monopolize all the time. They must not be so strenuous and prolonged, either, that they frustrate the very end for which they are maintained. For the special groups who wish to be expert in various games, special opportunities should be provided. But remember that the health and recreation of all rather than the training of championship teams should be the constantly observed ideal.

Work Through Play.—Two illustrations of ways of combining play with regular school activities are given here. The first is an excerpt from a report by Doctor Theodate L. Smith, then of Clark University, on some personal observations made while visiting Madame Montessori in Rome. She wrote:

If one visits one of Doctor Montessori's schools the children all seem to be occupied in interesting play. Some are lying on the floor playing with blocks or strips of wood painted in different colors. Some are playing blindfold games, finding out by the aid of their fingers alone the shapes and sizes of objects and different textures of silk, satin, wool, or linen. One child was absorbed in writing on the blackboard and did not even notice my entrance into the room. She was writing in large vertical script and forming the letters beautifully, and in answer to my question as to how long she had been writing, I learned that she had begun the day before. Occasionally some child . . . received either approval or suggestion that perhaps he would like to do something else. But the interest and attention of the children are never interfered with. If a child wishes to spend the entire school period of two hours in doing one thing, he is allowed to do so, on the principle that the *spontaneous attention* is a fundamental educative principle that must not be interfered with. In spite of the fact that

this particular school in the convent on the Via Guisti draws its children from an exceedingly poor section in Rome, their appearance was neat, and although no discipline was apparent, the schoolroom was in the truest sense controlled and orderly.

The second illustration is found in Doctor Dewey's *Schools of To-morrow*, p. 119:

The natural desire of children to play can, of course, be made the most of in the lowest grades, but there is one element of the play instinct which schools are utilizing in the higher grades—that is, the instinct for dramatization, for make-believe in action. All children love to pretend that they are some body or thing other than themselves; they love to make a situation real by going through the motions it suggests. Abstract ideas are hard to understand; the child is never quite sure whether he really understands or not. Allow him to act out the idea and it becomes real to him, or the lack of understanding is shown in what is done. Action is the test of comprehension. This is simply another way of saying that learning by doing is a better way to learn than by listening—the difference of dramatization from the work already described lies in the things the child is learning. He is no longer dealing with material where *things* are needed to carry out an act to a successful result, but with *ideas* which need action to make them real. Schools are making use of dramatization in all sorts of different ways to make teaching more concrete. For older children dramatization is used principally in the strict sense of the word; that is, by having pupils act in plays, either as a means of making the English or history more real, or simply for the emotional and imaginative value of the work. With the little children it is used as an aid in the teaching of history, English, reading, or arithmetic, and is often combined with other forms of activity.

Many schools use dramatization as a help in teaching the first steps of any subject, especially in the lower grades. A first-year class, for example, act the subject-matter of their regular reading-lesson, each child having the part of one of the characters of the story, animal or person. This insures an idea of the situation as a whole, so that reading ceases to be simply an attempt to recognize and pronounce isolated words and phrases. Moreover, the interest of the situation carries children along, and enlists attention to difficulties of phraseology which might, if attacked as separate things, be discouraging. The dramatic factor is a great assistance in the expressive side of reading. Teachers are always having to urge children to read "naturally," to "read as they talk." But when a child has no motive for communication of what he sees in the text, knowing as he does that the teacher

has the book and can tell it better than he can, even the naturalness tends to be forced and artificial. Every observer knows how often children who depart from humdrum droning learn to exhibit only a superficial, breathless sort of liveliness and a make-believe animation. Dramatization secures both attention to the thought of the text and a spontaneous endeavor, free from pretense and self-consciousness, to speak loudly enough to be heard and to enunciate distinctly. In the same way, children tell stories much more effectively when they are led to visualize for themselves the actions going on, than when they are simply repeating something as a part of the school routine. When children are drawing scenes involving action and posture, it is found that prior action is a great assistance. In the case of a pose of the body, the child who has done the posing is often found to draw better than those who have merely looked on. He has got the "feel" of the situation, which readily influences his hand and eye in the subsequent reproduction. In the early grades when pupils fail in a concrete problem in arithmetic, it is frequently found that resort to "acting out" the situation supplies all the assistance needed. The real difficulty was not with the numbers but in failure to grasp the meaning of the situation in which the numbers were to be used.

In the upper grades literature and history, as already indicated, are often reinforced by dramatic activities. A sixth grade in Indianapolis engaged in dramatizing *Sleeping Beauty* not merely composed the words and the stage directions but also wrote the songs and the music for them. Such concentration on a single purpose of studies usually pursued independently stimulates work in each. Literary expression is less monotonous, the phrasing of an idea more delicate and flexible, than when composition is an end in itself; and while of course the music is not likely to be remarkable, it almost always has a freshness and charm exceeding that which could be attained from the same pupils if they were merely writing music.

Meriam argues that play in school should not have for its purpose the making arithmetic and other studies more attractive. He says (*Child Life and the Curriculum*, p. 315):

Play thus used as a means of instruction is a serious reflection upon the subject-matter taught or the teacher teaching. *Something is wrong* when so much ingenuity is required in adapting games as a means of securing ends in certain traditional subject-matter. . . . The mere fact that play is recognized as one phase of the normal life of children justifies its place in the curriculum. . . . Real life, as an end, is of more value than school studies as a means. Thus the place which play has in the lives of children is its justification for recognition in

school, where the purpose is *to help boys and girls do better in all those wholesome activities in which they normally engage.*

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Do animals play? 2. Is there any relation between the intelligence of animals and their ability to play? 3. Do children play when ill? 4. List the various types of play activities of the children in your community. 5. Of the grown-ups. 6. Do teachers play sufficiently? 7. Are there adequate play facilities, including (*a*) space, (*b*) equipment, (*c*) time on the programme, in your public schools? 8. Should play centres in the cities be under the management of (*a*) the park commissioners or (*b*) the school board? 9. What are the following theories of play: Spencer, Groos, Hall? 10. Do boys on the farm need play?

References for Further Reading

1. Curtis, *Education Through Play*, chaps. I, II, III, IV.
2. Curtis, *The Play Movement and Its Significance.*
3. Dewey, *Schools of To-morrow*, chap. V.
4. Johnson, *Education by Plays and Games.* Entire book.
5. Lee, *Play in Education.*
6. Meriam, *Child Life and the Curriculum*, chap. XIV.
7. Norsworthy and Whitley, *Psychology of Childhood*, chap. XII.
8. Patrick, *The Psychology of Relaxation*, chap. II.
9. Waddle, *Introduction to Child Psychology*, chap. VI.

CHAPTER X

EDUCATION OF THE EMOTIONS

Importance in Education.—On graduation from school it is not merely what a boy knows that determines the value of his education. What he likes and dislikes; his attitude toward society and its problems; his attitude toward religion and morals; his attitude toward right and wrong; his attitude toward his duties and obligations; these are vastly more important than the few items of knowledge that he has gained. While in school the enthusiasm of the pupil for his work is exceedingly important. With enthusiasm he can generally accomplish his tasks with ease and efficiency; without it they become drudgery and in the end are only half performed.

In everyday life the emotional reaction toward life's duties and problems is the all-important thing. One man with facts and logic may give absolute proof that certain things ought to be done. But it takes the evangelistic type to fire the people with zeal to take hold and bring things to pass. Until the emotions of people are aroused they will allow the most important things to remain undone and will tolerate the gravest injustices in society. Some teachers are great living forces and get their students to accomplish the very best kind of work, while others succeed poorly and only through compulsion. The former are able to stimulate and arouse enthusiasm, the latter inefficient because they cannot make the right emotional appeal.

Consequently, in all education the understanding of and right education of the feelings and emotions are fundamental. Pestalozzi said: "Secure the love of the child and his intellectual education is an easy matter." While an exhaustive discussion of the feelings and emotions will not be necessary in

this elementary book, enough of a description to enable us to analyze these states in a general way will be desirable.

Meaning of Feeling.—The word feeling is used in a popular sense and in a technical sense. We must distinguish carefully between the two meanings. When one says "I feel cold," "I feel the wind blowing upon me," "I feel the contact of my pen upon my skin," "I feel the weight pressing down upon me," he does not use the term feeling in a strict psychological sense. He means rather that he has experienced *sensations* of cold, contact, touch, or weight. "I sense it" or "I perceive it" would be more accurate expressions. But the expression "I feel," much like the expression "learning by heart," has come to us traditionally, and like many traditions it is difficult of dislodgment. When one says "It feels painful," "It feels pleasant," "I feel sad," "I feel happy," "His heart throbs with patriotic feelings," the expressions are used to denote different mental states from the ones first indicated in the paragraph. The word in the former referred to perception, to intellectual processes. That is, it was incorrectly used to designate ideas gained through the *sensation* of touch. In the latter cases it refers not to the sensations or perceptions, but to our pleasure or repugnance connected with those intellectual states. Hence we may define feeling as follows: *A feeling is the simple pleasurable or painful side of any simple mental state;* or, as Sully has expressed it, "feeling marks off the pleasure-and-pain 'tone' or aspect of experience."

The lower forms of feeling are difficult to distinguish from sensations. For example, in hunger just what is sensation and what is feeling? The distinction must be experienced personally, "felt," in order to be appreciated. No formal word definition will make it clear. In the realm of the higher feelings or emotions it is easy to distinguish between feelings and sensations proper. For example, a feeling of patriotism or even of fear or anger would never be confused with a sensation. It is only when we come to the lower feelings or those which are largely physical that they can scarcely be distinguished from sensations. But certain selected examples will

probably bring out a distinction which may be appreciated. Suppose we listen to a saw being filed, or that we draw a rusty nail through our teeth, or allow a slimy snake or an insect to crawl over the skin. We experience the sensation of contact, but over and above and distinct from the sensation is a *feeling* of disagreeableness. This something is more than *knowledge giving*, it is *affective*, it is repugnant. I look at a beautiful picture, or witness a noble deed, and I experience something not merely knowledge giving or intellectual—I am pleased. This affective state is a complex feeling, really an emotion, which is later defined.

Professor Titchener has given us one of the clearest discussions of the distinction between feelings and sensations, and which I venture to reproduce. He writes:

> Let us introspect a true feeling (*A Primer of Psychology*, p. 61)—say, the feeling of drowsiness—and convince ourselves that it is made up of sensation and affection. Drowsiness begins, on the sensation side, with a sensation of pressure on the upper eyelids, with a tickling in the throat that leads to yawning and so brings a complex of muscular sensations, and with a sensation of pressure at the back of the neck (the head droops). The lids grow constantly heavier; breathing gets slower and deeper, so that its sensations change; the lower jaw becomes heavy, so that the mouth opens and the chin falls forward on the breast (pressure sensations); the neck sensations become stronger, the head heavier; and lastly the limbs grow heavy, and arrange themselves by their own weight. Sensations of temperature come from the surface of the skin, thrills of warmth running their course at different parts of the limbs and trunk. Over all this mass of sensation is spread an affection; an easy, comfortable pleasantness. And the affection outweighs the sensation; we know better that we "feel comfortable" than that sensations are coming in from this or that organ.—The total process, then, has all the marks of a true feeling.

For these simple, elementary, affective states we will reserve the name *feelings*, and to the more complex and seemingly "more mental" ones we will apply the term *emotions*. This does not imply that they are different in origin or kind; only different in degree.

Meaning of Emotion.—*An emotion is the complex agreeable or painful side of any mental state.* This correctly implies that

emotions are not different in kind from feelings, but merely different in degree. As sense-feelings are concomitants of sensations and simple perceptions, likewise emotions arise in connection with higher and more complex intellection. Mere sensations or perceptions, such as looking at colors or symbols or being cut by a knife, cannot arouse emotions. They may arouse feelings of pain. When we apperceive the import of symbols which convey some associational knowledge, such as a telegram might bring, we may be aroused to the deepest emotion of grief or the highest ecstasy of joy. A good dinner, warm clothing, a good fire, produce sensations and pleasurable bodily feelings, but in themselves they cannot arouse emotions. They may suggest higher thoughts and those in turn be accompanied by emotions.

It should not be understood that there is an absolute line of demarcation between feelings and emotions. Sense-feelings doubtless enter into the most highly developed emotions much more than we realize. True emotions are very directly related to the higher intellectual states. This relationship is full of pedagogical significance. Only a well-developed intellect can experience profound emotions. Sometimes there are outward manifestations of deep emotion, *e. g.*, love, fidelity, or religious emotion, in persons of low intelligence, but they are not real. Instead of being the accompaniment of profound conviction deliberately arrived at, they are largely imitative and often belong to egoistic sense-feelings. A boy cannot be taught genuine patriotism merely by shooting firecrackers, being feasted upon peanuts and candy, by waving a flag, tooting a tin horn, or shouting himself hoarse. Before the genuine sentiment arises which makes him really live for his country as well as to be willing to die for it, he must understand the deep significance of the manifold duties and privileges of citizenship. This the boy does not appreciate, and the ignoramus cannot.

Similarly with love. The youth believes himself in love when it is a mere sense-feeling, passion, and egoistic pleasure which dominate him. Only with increased intelligence,

broader experience, wider outlook, appreciation of its duties and responsibilities, does the real sentiment develop. Unfortunately, alas, too many never reach this stage! The alarming number of divorces, the instances of broken friendships, the rare cases of great sacrifices for others, all attest the foregoing conclusion. There is much love in the world which is genuinely altruistic, but there is much that passes under the name of love that contains not a germ of altruism. Love is indeed the greatest thing in the world, and many there are so small and stunted as never to comprehend its real meaning nor feel its impulses.

The Lange-James Theory of the Emotions.—There is a very close relation between the expression of an emotion and the emotion itself. If one could suppress all expression of fear or grief, undoubtedly the fear and grief would be much reduced. Likewise joy and gladness that are not expressed in some way are certain to be much less than if they were given customary expression. An interesting question was raised by Professor James, of Harvard, and Professor Lange, a Scandinavian psychologist, regarding the order of occurrence of emotions and their expression. The popular theory is that the sequence is as follows: (1) Knowledge, (2) The emotion, (3) The expression. But Lange and James object, saying that the real order is: (1) Knowledge, (2) The expression, (3) The emotion. James's classical illustration in support of this interpretation is: "We see a bear; we run; and then we are afraid." "We feel sorry because we cry, angry because we strike, afraid because we tremble."

While the interpretation of Lange and James is doubtless extreme, is there not probably a reciprocal relation between emotions and their expression? Does not the expression of an emotion increase the emotion, and does not the inhibition of its expression tend to suppress the emotion? It takes no acute psychological observation to note that an emotion once initiated is greatly increased by giving way to the outward manifestations of it. To bow one's head when already suffering grief lowers one's vitality and increases the grief. To be

sure, nursing the grief through contemplation of its cause is one source of its production, but undoubtedly the bowed head, the curved spine, the lowered eyelids, the drawn lips, all are causes as well as effects. Who could feel any enthusiasm in giving the college yell when sitting down and with head bowed low in reverential attitude? At the football-game one's excitement increases largely in proportion to the amount of noise and motion he makes.

It is bad pedagogy to try to secure enthusiasm by restricting bodily movement. Soldiers hear the "Quick-step, march!" their pace quickens and their courage rises simultaneously. The influence of music in war is tremendous. Let the soldiers hear a funeral dirge. Their pace slackens and their spirits fall. "Every one knows how panic is increased by flight, and how the giving way to the symptoms of grief or anger increases those passions themselves. Each fit of sobbing makes the sorrow more acute, and calls forth another fit stronger still, until at last repose only ensues with lassitude and with the apparent exhaustion of the machinery. In rage, it is notorious how we 'work ourselves up' to a climax by repeated outbreaks of expression. Refuse to express a passion, and it dies. Count ten before venting your anger, and its occasion seems ridiculous. Whistling to keep up courage is no mere figure of speech. On the other hand, sit all day in a moping posture, sigh, and reply to everything in a dismal voice, and your melancholy lingers. There is no more valuable precept in moral education than this, as all who have experienced know: if we wish to conquer undesirable emotional tendencies in ourselves, we must assiduously, and in the first instance cold-bloodedly, go through the *outward movements* of those contrary dispositions which we prefer to cultivate. The reward of persistency will infallibly come, in the fading out of the sullenness or depression, and the advent of real cheerfulness and kindliness in their stead. Smooth the brow, brighten the eye, contract the dorsal rather than the ventral aspect of the frame, and speak in a major key, pass the genial compliment, and your heart must be frigid indeed

if it do not gradually thaw!" (*Principles of Psychology*, II, p. 462.)

Although I do not subscribe to the Lange-James theory in its entirety, I recognize many facts which go to show that the various bodily conditions have a very marked influence upon the emotions. One with biliousness cannot easily feel in a happy mood. Our general attitude toward life is strongly colored by our state of health. With sound bodies and good digestion all the world is apt to appear roseate. But a poor night's rest or an unusual ache is most sure to give it a most sombre tint. There is undoubtedly a very definite interrelation among the three states—knowledge, emotion, action. They are probably three inseparable phases of every complex psychophysical state, and it is impossible for them to be entirely isolated. Sometimes one phase may preponderate, sometimes another. The exercise of any one undoubtedly influences each of the others. An exhaustive discussion of the theoretical aspects of the question will not be attempted in this connection. The reader who is interested may refer to James,* Lange,† or Ribot.‡ A few illustrations will, however, be adduced to show the exceedingly close interdependence between the emotions and the physical expressions. An attempt will also be made to indicate some of the many very important educational bearings.

We know that in play-acting when we portray a given character we tend to feel the emotional states represented. For this reason many believe it is dangerous to assume the rôle of a rogue or a rascal. Taking the rôle of a noble character uplifts one and stirs lofty desires. Undoubtedly every one is moved emotionally by assuming an attitude of prayer or devotion. A boy whistles on going through a lonely place at night, and thereby feels less afraid. When he has been hurt by a school fellow or worsted in an encounter, he laughs a bravado laugh though ready to cry, and thereby dispels the desire to cry and manages to feel courage, which was slipping

* *Op. cit.* † *Ueber Gemüthsbewegungen*, Leipsic, 1887.
‡ *The Psychology of the Emotions.*

away. We tell a crying child, "Dry your eyes and you'll feel better," rather than "Feel better and then your tears will cease."

Educational Suggestions from the Lange-James Theory.— The educational bearings of this theory are manifold and far-reaching. Actions and states constantly repeated determine what one is. What one is he comes to believe in and the customary becomes pleasurable, at least in a negative way. Consequently it is good pedagogy to teach children, for example, to assume an attitude of cheerfulness, to sit up straight, to expand the lungs, to walk sprightly, to have a good laugh occasionally. It all reacts upon their moods. For a person to go bent over, with his back humped up and his chest drawn in, is sufficient reason for him to become low-spirited. Plenty of oxygen, sufficient muscular exercise, and good bodily postures and habits are not only conducive to but absolutely necessary to the maintenance of cheerfulness. The one who becomes anæmic and nerveless is the one who is irritable and cross. Many external conditions contribute not a little to one's emotional tone. The weather determines, more than we think, the trend of one's conduct. Poor lighting is often responsible for not only defective vision and bad headaches but also for much peevishness. Because of the intimate relations between the emotions and the intellectual and volitional states, it is important for the educator to bear in mind constantly the necessity of securing bodily comfort and emotional buoyancy. Heating, lighting, ventilation, all have their effects. Proper seating is a feature too little considered. Cramped position or dangling feet produce irritability, to say nothing of bodily malformations. Recesses, alternation of work and play, must also be considered in trying to secure desirable emotional attitudes.

Through imitation one unconsciously assumes the attitudes of those about him. Consequently imitation plays a most important part in the determination of the emotions. A light-hearted person diffuses his feelings among all whom he meets. Similarly one who is low-spirited casts a spell of gloom over

all his associates. Feelings are even more contagious than disease. Children are very quick to be inoculated with the moods affecting the teacher. On those days when children are bad-natured, fretful, or especially trying, the cause can usually be traced to some external influence—bad weather, an irritable teacher, improper lighting, insufficient nutrition, or physical discomfort.

The Emotion of Fear.—This emotion has played a very important rôle in civilization. It is fundamentally the basis of self-preservation. Only through fear of personal pain does the child learn to avoid harmful experiences. In the home, in the school, and in society, fear is one of the great deterrents to misconduct and crime. Even in religion its place has been quite prominent, often even dominant.

The telling of sensational stories is one of the most frequent causes of fear in children. Injudicious servants, playmates, and even parents and teachers, frequently tell children of goblins, ghosts, and bogies, sometimes just to interest children, but even more often to scare them. The children are not seldom frightened into obedience by threats of being taken by the bogey man or the bears. Soon all dark and unexplored places are through the imagination peopled with frightful creatures. The child comes to dread a new situation and becomes timid and hesitant in undertaking new things. If the child is neurotic in addition to this psychical condition, he is easily made a coward. Bashful children injudiciously treated are frequently made to suffer untold agonies through imagining ridicule or censure.

A bashfully inclined child, by being repressed and made to fear being observed, and through imagination of unfavorable comment, can be made a lifelong social coward. When we are thinking of making Young America "mind" or "to be seen and not heard," we should consider whether we may not be repressing the very boldness which will make for social and moral courage in manhood and womanhood. Better smile at a little overconfidence or put up with egotism which smacks of impudence than repress every manly and womanly instinct

of courage. There are doubtless thousands of weak-willed, shamefaced, limp-spined men in the world who owe their condition to fears engendered by overstrict and injudicious parents. To have made them valiant and courageous there would have been necessary only a little protection from foolish fears and a stimulating encouragement to have confidence in their own powers. To be told continually that one will fail in an undertaking is with the naturally timid almost fatal to success. It is often unfortunate to have children in school obtrusive in their boldness, but it is probably more unfortunate to have a child utterly distrustful of his own powers. Life is so full of real disappointments that no one needs to be harassed with fears of any unnecessarily imagined ones. Self-confidence is one of the greatest factors in success.

The results of the use or the abuse of fear may be suggested in the following:

Timidity		Caution
Cowardice	.... Fear	Prudence
Bashfulness	(Negative) (Positive)	Foresight
Self-consciousness		Fear of wrong

It is apparent that to educate the child so that he shall learn to fear wisely and effectively is a very important part of education. The lowest form of fear is instinctive and directed toward self-preservation. Of the highest we may voice the proverb that "The fear of the Lord is the beginning of wisdom." Marden says: "Doubt, uncertainty, fear of failure, are the greatest enemies of mankind. No man ever yet accomplished a great deed with a doubt clouding his mind. The miracles of civilization have been performed by men and women who believed in themselves. In spite of ridicule, incredulity, and abuse they maintained unwavering faith in their power to accomplish the tasks to which they had set themselves."

The following good suggestions are in entire harmony with the teachings of the Lange-James theory of the emotions: "'Assume a virtue if you have it not' is sound advice. There

is a great deal in assuming the part or character you desire to play in life's drama. If you wish to take the part of a successful man you must assume the mental attitude, the outward manner of one. It is not difficult to pick out a successful man in the street. If he is a leader, a man who relies upon himself, every step, every movement indicates it. There is assurance in his very bearing. He walks as if he were master of himself, as though he believed in his ability to do things, to bring about results. People are impressed in spite of themselves by a confident bearing. They trust a man who believes in himself; they take his ability for granted, but they have only pity or contempt for the self-depreciating doubter. The man without self-confidence and iron will is the plaything of chance, the puppet of his environment, the slave of circumstances. With these he is king, ever master of the situation." (Chicago *Record-Herald.*)

The Educational Control and Uses of Anger.—The child should be taught early to restrain angry passions. A habit of flying into a rage every time his wishes are thwarted is one that will prove a source of great weakness in later life. The individual who goes into a blustering rage is a weak opponent for the man who keeps his head. In argument or in physical contests the angry man dissipates his energy and becomes an impotent antagonist.

However, the child should be taught that there is a just type of anger. He should distinguish between personal grievances and the wrongs inflicted upon society. He should be led early to look with indignation upon that which is base, unjust, and unworthy. He should be trained to look with disgust and abhorrence upon conduct that is disgraceful not only where personal injury has come to him but whenever justice and right have been outraged. Children must be aroused out of indifference to wrongs witnessed against others, into active championship of the oppressed and the downtrodden. The habit cannot be formed too early. There is something wrong with the education of children of 10 years of age if they delight in the persecution of animals, in seeing weak children

bullied and abused by the stronger. Often children tease others in a thoughtless way, but no well-trained child delights in witnessing or causing real injury to another. Abraham Lincoln, in manhood the emancipator of the lowly slave, in boyhood was laughed at as the friend and champion of the poor inoffensive turtles which were stoned by the rude schoolboys. He was as ready to fight for the rights of a turtle as for the oppressed black man. Though teasing and bullying are instinctive in childhood and youth, they can be and should be well under control before the child is 10 years of age.

It is only through the development of the emotion of indignation against injustice that one becomes the real friend of society. Not to injure others is well, but not enough; it is only negative. One must be positive as well as negative. Proper development of this feeling leads one to defend his friends and neighbors, his state and his country, as well as himself. It leads one country to defend another unjustly attacked. It led the United States to defend Cuba and the Philippines against an outrageous foe. It led the Union to dismemberment when each section believed itself to be the champion of certain inalienable rights apparently violated. It led the people of the United States to send the flower of her youth to stamp out the world-wide menace to democracy and freedom. These feelings must actuate the philanthropist, the minister, and the true statesman. The feeling is apt to be ill nourished, because personal loss often follows attempts to champion the rights of society. Were the emotions properly developed in all, our cities would be well governed, our streets clean and well lighted, public sanitation perfect, our children properly schooled, our laws better obeyed, justice better administered, our taxes cut in half, our public parks increased, public nuisances abated, the poverty-stricken provided with work, and municipal corruption eliminated. But so long as the public conscience is apathetic and we do not feel indignant at public wrongs unless we are affected individually, just so long will public wrongs continue. We are too apt to close our eyes to everything that does not strike home.

The criminal knows this. Only the individuals wronged are anxious to testify against the criminal, and they are easily eluded. But when every individual in a community is ready to champion the rights of every other individual in the community, then the criminal finds it dangerous to operate there. We need a multitude of men such as one of our great cities recently furnished us in the person of a young lawyer, who tracked to their hiding-places and brought to the bar of justice a whole ring of corrupt city officials. So unselfish was he that he rejected the offer of the grateful city of a house and lot as a recognition of his meritorious altruism. His services had been only in the cause of right and as an indignant rebuke against the evils which the city suffered. It was only such service as every ideal citizen ought to be willing to render.

The child should also be taught to stand up for his personal rights. To be sure, he must learn not to assume those which do not belong to him. But he must learn to know his rights and to maintain them. This means that he must not allow others to impose upon him or to bully him. We applaud the nation which fights the foe that insults her colors, and why not the individuals that maintain their personal dignity? The boy or girl who is habitually teased and bullied is usually one with cowardly traits. The one who is cowardly in defense of himself will seldom exhibit courage in protecting the rights of others. Every one should have self-respect and should maintain it. Righteous indignation is not only permissible but commendable whenever injustice has been witnessed, whether the offense is against oneself or against society.

Sympathy means a condition in which one enters into the feelings of another, sharing the pleasures or pains. It is an emotion of rather late appearance. Although we are told that it exists among the lower animals, it is there of a very low order. Except as a manifestation of maternal instinct in the animals we find very little indication of it. Most animals leave wounded or disabled comrades to their hard fate. Romanes believes that sympathy is first seen among the hymenoptera. He places its first appearance in the child at

about five months. Sigismund records that he noticed sympathy at the end of three months. Sully and Tiedemann believe that they have noticed it as early as the end of the second month. But these instances are all cases of imitation and have very little of genuine sympathy in them. One child will cry when another cries or sometimes when it hears music, but it is questionable how far the feelings are shared, and still more questionable whether there is a desire to enter into the other's feelings, which is often true in higher stages of sympathy. At 2 years and 10 months of age my boy was looking at a picture of a boy crying, and said: "Boy hain't got no mudder." I answer, "No, the boy has no mother," thinking merely to coincide with his expression. He repeated the same thing again, and burst into tears and sobbed bitterly. I cannot think it was a deeper feeling than mere contagion from the appearance of the crying child, for he had absolutely no idea of the import of what he said. He knew nothing of death or the meaning of bereavement.

To really sympathize, one must put himself in another's place. This often requires imagination of the other's states. To imagine anything, one must have had a previous experience of that thing. One must at least understand the conditions producing the affective states of another in order to sympathize with them. Circumscribed experiences often make it impossible for an individual to have broad sympathies. There is nothing that gives one such powers for usefulness as breadth and variety of sympathies. No person in public relations can hope to succeed in drawing masses to him unless he can go out to meet them in sympathy. To sympathize with them means that he must understand their point of view. The great man who, like Lincoln, can perform some act which all the masses can understand and appreciate is the one who can gain their sympathies. They understand the simple, homely, every-day acts, and therefore their sympathies are enlisted. The more philosophic acts of statesmanship are not understood, but through the commonplace acts faith is engendered. The great statesman who has only the philo-

sophic view, and who can never come to the people's level, will never raise the people to his level. In thinking of Queen Victoria, all else is forgotten about her by the multitude except that she was a tender mother, a devoted wife, and a dutiful daughter. Because of these characteristics she will go down through all the ages beloved by the masses.

The teacher who cannot meet pupils on their own level, though he may be ever so scholarly, wise, and philosophically just, will never enlist their sympathies. Many teachers have either forgotten childhood or else they never had a real childhood, for the pupil's actions are no longer comprehensible to them. They do not and probably cannot sympathize with child life. Such teachers should either cultivate an intelligent acquaintance with child life, so as to understand and appreciate it, or quit the business of teaching. It is lamentable that in the teachers' preparation the main emphasis has been placed upon the understanding of subject-matter and so little to developing a deeper and more sympathetic understanding of child life.

It is highly important that pupils be in sympathy with the school and its functions. This is often, too often, not the case. Pupils feel that the teacher is an autocrat dictating laws without reference to the wishes or even welfare of the children themselves. Few openly rebel, though many secretly long for freedom. Such need not be the case if pupils are only led to see the meaning of school rules and regulations, and if they have developed a feeling of personal ownership in the school. Though I have no patience with the artificial schemes of self-government, so called, in which the teacher abandons all rights, privileges, and authority, yet pupil co-operation must be secured. This can only come through their understanding of the aims, purposes, and means of government. They should participate and co-operate to the fullest extent possible, but, what is equally as important, they should understand that their immaturity and their inexperience place limitations upon their powers of governing wisely, and hence the necessity of acquiescing in those means em-

ployed by teachers and school boards. They should be led to see that the school is theirs, and that whatever affects the individual affects the school, also that whatever affects the school in turn affects the pupils in the school. As soon as a correct understanding is gained, a sense of participation results. As soon as a sense of participation is developed, the feeling of sympathy begins to grow.

From the standpoint of social needs it is greatly to be desired that children become sympathetic with the various forms of political and social organizations. This can only be accomplished by obeying the laws of the development of sympathy, viz., by giving a thorough knowledge of those things with which the children ought to sympathize. The classes of people who are out of sympathy with institutions are the ones who do not understand them. Being in sympathy with our institutions does not mean being satisfied with everything, but it does mean intelligent appreciation of the conditions under which they have been developed and are developing, and also patience with the slow pace of development. It should also reveal definitely that social development depends upon the active co-operation of all the individuals composing society. The doctrine of helpful service needs much emphasis in our homes, schools, and churches.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Distinguish between a feeling and an emotion. 2. State the Lange-James theory of the emotions. 3. What relation is there between physical states and emotions? 4. Is there a direct relation between intelligence and the emotions? 5. Can a feeble-minded individual be honest, brave, patriotic? 6. Are all intelligent persons necessarily honest, brave, patriotic? 7. How can the school help in making children honest, brave, patriotic? 8. What is the educational significance of the Lange-James theory? 9. Are fear, anger, and love instinctive? 10. What school subjects contribute to the education of the emotions most? least?

References for Further Reading

1. Bolton, *Principles of Education*, chap. XXV.
2. Cameron, *Psychology and the School*, chap. X.
3. Colvin and Bagley, *Human Behavior*, chaps. V, VI.
4. Norsworthy and Whitley, *Psychology of Childhood*, chap. V.
5. Thorndike, *Principles of Teaching*, chap. XII.
6. Woodworth, *Psychology: A Study of Mental Life*, chaps. VIII, IX.

CHAPTER XI

MOTIVATION AND INITIATIVE

What Is Interest?—Whenever we like anything, whenever we pay attention to anything, we are interested in it. Things which interest us are voluntarily and purposely attended to without external compulsion. A majority of the stimulations of the senses never receive attention because they have no interest for us. James wrote (*Principles of Psychology*, I, pp. 402–403):

> Millions of items of the outward order are present to my senses which never properly enter into my experience. Why? Because they have no *interest* for me. *My experience is what I agree to attend to.* Only those items which I *notice* shape my mind. Without selective interest, experience is an utter chaos. Interest alone gives accent and emphasis, light and shade, background and foreground—intelligible perspective, in a word. It varies in every creature, but without it the consciousness of every creature would be a gray, chaotic indiscriminateness, impossible for us even to conceive.

Interest as a Means.—Many teachers seem to regard interest merely as a means of getting pupils to do disagreeable tasks; a sort of sugar coating which will render bitter pills less objectionable. Some arithmetic is to be mastered, and devices must be sought which will help accomplish that end. Under the guise of one thing pupils are to get some other thing. New words are to be mastered. Call them fishes in a pond; call leaves fairies; call geography lessons journeys, etc. These may be very good devices, but the interest is not in the thing to be acquired. The young teacher is apt to think that interest is largely a matter of *manner of presentation* of a subject. It is supposed that by proper skill, sufficient smiles, a lively manner, and plenty of amusing stories that any subject can be made interesting to any pupils. The

whole interest is supposed to inhere in the teacher. To keep the pupils good-natured, to keep them in school, to avoid conflict, to cause them to like her, seem to be the dominating influences.

Such a teacher seldom cares what kind of an interest is felt in the subject after the task has been accomplished. Will the pupil choose this subject later on? Does he apply it to his daily life with pleasure, or does he drop it out of his existence when it ceases to be his lesson? These results do not seem to be of concern. Interest to such means pleasure, amusement, having a good time. They usually feel that struggle, work, overcoming of obstacles are antagonistic to interest. In planning to keep pupils interested they usually try to amuse them, to relieve from difficulties, to smooth the path.

Interest as an End.—But while it is desirable to produce interest in order to secure study, interest as an end is desirable. One of the great aims of education should be to stimulate abiding interests in the studies themselves, and also to make the studies lead to permanent and desirable life interests. Spencer tells us (*Education*, p. 127) that "As a final test by which to judge any plan of culture, should come the question, Does it create a pleasurable excitement in the pupils?" Again he says that if a given course of study "produce no interest, or less interest than another course, we should relinquish it." McMurry says:

> The common understanding has been that instruction is aiming at knowledge, and that interest is one of the means by which that aim can be best attained; in brief, knowledge is the end and interest the means. But the new standpoint asserts interest to be the highest aim of instruction, and ideas to be the means by which that object can be reached; that is, interest is the end and knowledge is the means. Thus the tables have been turned. There is now a strong inclination on the part of many to measure the success of years of teaching not by the quantity of information one possesses on Commencement Day, but by the degree of interest engendered in the lines of study followed. The attitude of mind toward study is, to them, the most important point. (*Educational Review*, 11, p. 147.)

Interest and Effort.—Many make the mistake of regarding interest and effort as directly opposed. Such is a very erroneous interpretation. Interest may, in fact, lead to the most strenuous effort. The greater the enthusiasm in one's work the better it will be accomplished. But there is no dodging the stern reality that life is full of drudgery and detail work, and interest will not attach to the thing itself or very strongly to the details. The scientist has to deal with long, tedious columns of figures, which must be added, averages must be found, and averages of averages, maximum amounts, and minimal differences, average errors, average deviations, and the like; all of these processes requiring drudgery which few can stand without feeling great fatigue. Now were his interest not above and beyond in something more ultimate he would never get through the task.

We do not wish to have the child do things unwillingly. Things should not be done because they are disagreeable, but neither should necessary things be omitted because disagreeable. Every one has felt more self-respect many times when he persisted in pursuing to the finish some task involving disagreeable drudgery. I believe the farmer boy does when he finishes well the field of corn among the stumps, binds the bundles in the hot harvest sun, ploughs the stony field, or repairs properly the battered fence. So, too, the child in school feels satisfaction and pride when he has a good geography lesson, a perfect spelling-list, or a model page of writing, even though the mind would have feasted on marble-playing, chasing butterflies, making rabbit-traps, or going swimming. A university student once said to me: "I would like to take a certain attractive course, but I have started this German; I have no end of difficulty with it, and I feel that to give it up would be like yielding to temptation. To fight it out will be to strengthen my moral nature." Who that has any stamina has not worked for hours to get the right answer to a problem or a puzzle, even though the answer were of no consequence and forgotten in a few minutes? Certainly the drudgery was not interesting. The interest lay in conquering, in mastery

of inclination to ease, in the end to be accomplished. The loafer would have yielded to momentary ease. The future would have been dismissed.

Interest the Prime Consideration in Education.—Learning which is not the outcome and accompaniment of pleasurable interest does not call forth genuine self-activity and does not give training. The influence is not only negative but positively dangerous. It produced divided attention, and, as Dewey remarks (*Interest in Relation to the Training of the Will*, p. 11), "the theory of effort, . . . means a virtual division of attention and the corresponding disintegration of character, intellectually and morally. . . . A child may be externally entirely occupied with mastering the multiplication table, and be able to reproduce that table when asked to do so by his teacher. The teacher may congratulate himself that the child has been so exercising his will-power as to be forming right intellectual and moral habits. Not so, unless moral habit be identified with this ability to show certain results when required. The question of moral training has not been touched until we know what the child has been internally occupied with, what the predominating direction of his attention, his feelings, his disposition has been while engaged upon this task."

The greater the amount of interest the better. No one ever accomplished much in any direction until he gave himself to his task body and soul. The scriptural injunction, "Whatsoever thy hand findeth to do, do it with thy might, with all thy heart, with all thy mind and all thy strength," contains the key to the secret of success. Work should not be made disagreeable or irksome. But even if exhausting or irksome, the end to be attained should be so alluring that no amount of disagreeableness could drive us away.

A certain writer explained as follows the drive that urged him to stick to his task:

> As I write these pages the mercury is mounting daily to 110 degrees in the shade. My room is stuffy and almost unbearable, perspiration makes my garments sticky, my sweaty hands soil the paper, and the

hot wind occasionally seizes my paper and takes it pirouetting across the room. All these are annoyances, sufficient to drive me from writing pedagogics to seek Lake Superior breezes. No one has set me the task of writing. I am free to go to Lake Superior. Then why do I persist? I answer, interest in the result. I may see the necessity of formulating properly certain conclusions for my classes next year, or I may be eager to measure my strength, to see what I can do. I may be pleasantly dreaming of the converts to my doctrines, or of the money that will seek my coffers. Any of these may be possible ideas that have become fixed in my consciousness. It is the imagined end, possibly a will-o'-the-wisp, but nevertheless pleasing and soul-consuming, that is impelling me on. While the phantom is bright I forget the petty annoyances of heat, moisty hands, crying children, rumbling wagons, clouds of heated dust, etc. I am living in the result. I am interested.

Instincts and Interests.—Interests are primarily a function of instincts. Secondarily, they are determined by environment and education. Of course interest in a particular object is not determined by instinct; but the type of interest is determined in broad outlines by instinct and heredity. The hound is interested in the chase, the lion in stalking its prey, and the cat in stealthily creeping upon its victim. The boy is naturally interested in warlike, savage plays, the girl in dandling her dolls, the mother in sacrifice for her infant child. The child's dominant interests are selfish. With the approach of manhood sex-interests, home-making, and the religious interests make their appearance. As instincts have their periods of nascency, full bloom, and decay, likewise interests growing out of the corresponding instincts have their periods of birth, growth, and decay. The presence of deep, abiding, general interests indicates the possession of corresponding instincts. Conversely, the absence of a given type of interest signifies the absence of concomitant instincts. No one ever possesses a genuine interest in any line of action without native power in that direction. Persons devoid of musical ability never voluntarily manifest a persistent interest in producing music. They may enjoy hearing others perform, but their interest will be too feeble to impel them to actual participation. Those without athletic ability (poten-

tiality, instinct) never are deeply enough interested to participate to any extent. Those who sit on the bleachers and yell themselves hoarse are not necessarily interested in athletics. They are more likely to be interested in the sport because of a sort of gambler's interest, or because of interest in the institution represented. Genuine interest in anything impels one to active participation in it.

The foregoing facts have an important bearing upon teaching. The boy who is not interested in his mathematics and, though diligent, cannot become interested, probably has no instinct—no ability for it. The one who is slow to develop an interest in languages, in music, or in drawing, presumably is deficient in power, ability—instinct—in those particular directions. Lack of interest and corresponding ability at any particular period do not necessarily mean permanent lack in the given direction. Oftentimes a power is dormant, the nascent period has not appeared. Unfortunately, sometimes it may mean that a nascent period has passed without proper stimulation. Frequently when the child is not interested in his arithmetic, he has not arrived at the period when arithmetical thinking is sufficiently developed. Successful accomplishment is necessary to the continuance of interest. The child, as well as the adult, who continually fails through inability soon displays distaste for that particular activity. At a later time, when association fibres have matured, relational thinking can be engaged in, and abstract mathematical thinking may be a delight. The fundamental cause of shifting interests is the fact of changing powers—instincts—through processes of development. To be sure, lack of interest may not be due to lack of ability, but no other cause is so largely responsible. Consequently any lack of interest should excite suspicion and cause investigation to determine whether there is a deficiency of native power in the given direction or a defect in the means or manner of approach to the activity.

Children's Egoism.—The child's early instincts are selfish. He cares for naught except his own egoistic pleasures. They are not mere animal pleasures, as of eating and drinking.

Most of his egoistic pleasures are psychical and of a high order. His delight and satisfaction in mental accomplishments are attested in an infinitude of ways, from the repetition of striking a table with a spoon to hear the sound up to the acquisition of intricate language co-ordinations, making collections, and amassing funds of information just for the satisfaction of knowing and discovering.

The child's egoistic nature makes him easily interested in competition with his fellows. This is perfectly healthy and in no wise dangerous unless carried to extremes. By degrees the child may become interested in doing things from more altruistic motives. The desire to please his teacher or parents and to stand well in the eyes of his fellows plays a very important rôle in keeping the child industrious at proper activities.

The child whose parents are interested in his accomplishments has a much greater incentive to work than the one whose parents are indifferent to his childish activities. Sympathetic interest by the parent in hearing of the child's progress in reading, in praising his writing or his drawing, exercise very important influences. Honest praise is very desirable in helping to maintain interest. Nobody, least of all a child, wishes to do tasks unnoticed. He is naturally interested in winning favor, place, or other rewards. Then there is a negative factor which stimulates and may even heighten interest—namely, the fear of loss of position, loss of caste, degradation, or even punishment.

Growth of Altruism.—Lastly come the altruistic interests in which others form the centre of consideration. Although germs of these interests appear early, it is only with approaching adult life that egoistic interests are subordinated to altruistic ones. In many, even the majority, they never become very strong. The evolution of the teacher or minister illustrates the characteristic development of interests from the lower to the higher. Work and study are at first undertaken for the purpose of self-improvement, and for the purpose of gaining a certificate or license. This certificate is desired be-

cause it will bring personal reward in the way of position and pecuniary remuneration. Later the work is pursued for the sake of the pupils or the pastoral flock, and later still for the sake of humanity in general. Finally the deepest religious interest comes to full force. This is the highest altruistic interest. True religious interest concerns itself with the highest welfare of others as well as of self. And it is ever the ideal, largely unrealized, which forms the motivating interest.

We should not expect the young child to be especially altruistic. If he is, there is something abnormal about him. Of course his egoism often makes it uncomfortable for his seniors, but he is simply passing through a stage which he will soon outgrow. With the oncoming of adolescence the budding of altruism ought to become thoroughly apparent. This is the time for ministration to such impulses if ever they are to be developed.

The Child's Interest in the Concrete and Objective.—The child is interested in what stimulates his senses. He is attracted by what he sees, hears, touches; not for what the stimuli signify, but out of pure sense-gratification. Watch the babe follow a light, turn toward sounds, express gratification at tactile contact with things. External objects and parts of his own body are handled, just for the pleasure of touching. What is bright-colored, full of motion or sound will attract. As his attention becomes directed toward and centred upon things by these means, he gradually learns about things, and then apperceptively he becomes interested in new things which bear a relationship to what he has already understood. At this early stage it is necessary to make things attractive to the senses. Bright-colored pictures, various colored letters, pleasing tones, rhythmical jingles, exercises full of motion and muscular activity, as motion songs, doing things, and making things, must be brought into requisition. The child mind deals with the concrete, and any education that attempts to foist abstractions instead produces but a veneering which is sure to scale off.

As much time as possible in the schoolroom should be

occupied in doing—"learning by doing." It not only fosters interest but actually renders knowledge more clear and definite. In arithmetic much objective and constructive work can be brought into requisition. In denominate numbers every measure should be handled. The pupil can measure the schoolroom, the wood-pile, the coal-bin, or the water-pail. All the problems should be *experienced*, at least until understood, before attempting a solution. For example, here is a post whose height is known, and the length of a building or height of a tree is desired. Have the shadows measured or the triangles actually constructed until all conditions are fully grasped. A half-hour spent out in the yard making measurements and getting all the conditions, instead of hours of aimless frittering with the symbolism of arithmetic inopportunely introduced, will make the task pleasant and profitable.

It is easy to enlist the interest of children in nature about them. Here, as in all cases, apperception is the basis. The farmer boy often goes through life seeing little of the wonderful things about him, simply because he has never been taught to see. Teach him that geological forces and botanical processes have a relation to all life about him and a new world is opened up. Give country children a few of the obvious facts concerning plant life, growth, circulation of sap, fertilization of flowers, relation of bacterial life to plant growth, something concerning food ingredients in soil, rain, and air, the action of light on plant growth, some of the easy principles of horticulture, and fertilization, tactfully dispel some of the many superstitions and saws relating to life and growth, and they become new creatures; their eyes will be opened, they will be born again. Such procedure will lead them easily to the perusal of books like Darwin's study of vegetable mould and of earthworms, of his *Origin of Species*—into science. The first geological interest I ever acquired came through chance reading about the action of frost upon ground ploughed in the fall. My interest was immediate. I wanted to know what would give better crops. The interest kindled has not died out.

The introduction of the study of elementary agriculture into the country schools would give a new worth to country-school instruction.

Interest in Utility.—"What use can be made of this?" is one of the common questions asked by children. It is not an idle question with them. It represents a deep-seated interest. I have noticed children very apathetic over lessons on coal, iron, and other minerals, as long as the emphasis was put upon classification and other, to them, abstract considerations. But as soon as the idea of its utility in the economy of civilization was introduced they were all aglow with enthusiasm. They care little for classification and scientific principles. They have not reached the age for that, but "What is it for? How is it used? How does it affect them?" are all vital considerations. In this instinct lies a very strong leverage for securing efficient work. A boy who hates arithmetic but likes machinery can easily be led to see that mathematics is the key to its understanding and construction. After early childhood, interests are very largely incited in this fashion. The boy learns his lessons because by so doing he can gain favor, rank, prestige; because they will enable him to accomplish something else. His reading, he comes to believe, will reveal entertaining stories; through writing he may communicate with his chums and his arithmetic will enable him to make things.

Children's own stories and spontaneous drawings are full of ideas of action, and especially actions related to use. Binet records (*Revue Philosophique*, December, 1890) the results of some tests made upon his two little girls, 2½ and 4½ years old. He asked them what they meant by a number of words they used, such as horse and clock, and wrote down their answers. Their answers indicated that they were most interested in the use, and next in order came the movements. They seldom described things by color, form, or size, but told what it could do or for what it was used. Barnes tried essentially the same experiment with more than a thousand children, and found that their definitions were in the following

order: By far the larger number from 6 to 12 years explained in terms of use. Next in order came definitions by placing under a more generic term, as: "A dog is an animal." Third in order was action; fourth, quality; fifth, place; sixth, color; seventh, form; eighth, structure; ninth, substance. With increasing age the tendency to explain in other terms than use increased. At all ages up to 15 use was very strong in all their explanations. Barnes says that children of 7 "consider that they have told you all about an object when they tell you what it is for. 'A horse is to ride,' 'A mama is to take care of children, and a box is to put things in.' To the young child all things exist to meet some of his own particular wants; thus, 'A village is to buy candy in'; 'A bird is to make meat with, or is good to lay little eggs'; 'A dog is good to catch flies'; 'A mama is good to cook, or to whip little children.'" (*Studies in Education*, I, p. 207. See also p. 227.)

An illustration borrowed from Adams is to the point:

> John was a perfectly normal type—clever and very careless. Suddenly the mathematical master reported an amazing improvement in John's marks. On investigation the improvement was found to limit itself to mensuration. Still further inquiry narrowed down the prodigy to segments of circles; but as those could not be understood without previous work, John asked and obtained permission to work from the beginning. In three weeks he had bored his way honestly through half of Todhunter's *Mensuration*, and was very eager to be promoted to the volumes of spheres. John was now the talk of the master's room, where nobody had a good word to say for him except the science master, who reported that John had developed a violent interest in chemistry, and was showing leanings toward volumetric analysis. The whole trouble was afterward traced to its primary bacillus in a gigantic balloon that John was projecting. How to cut the gores drove him to Todhunter; how to calculate how much zinc and sulphuric acid were necessary to float his balloon with hydrogen had urged him to chemistry. Balloon-making did not make mensuration or chemistry easy; it made them interesting. (*Herbartian Psychology Applied to Education*, p. 264.)

A business man desires to accomplish certain ends; it may be the selling of sewing-machines in Europe, but a lack of

knowledge of the languages stands in the way. He sets himself assiduously to mastering those languages. At first the interest is not primarily in the German, the French, or the Scandinavian; it is avowedly in selling sewing-machines, but once they are learned, undoubtedly an interest is built up in the languages for their own sakes. Much in the same way one goes to college. A college education is a necessary qualification for our ideal society, business, entertainment; it will furnish us our passport through many desired portals. These are utilitarian motives, but probably no study is voluntarily taken without some such motive. It could not be otherwise. Lack of apperceptive ideas prohibits us from being interested in a subject of which we know nothing. After all, are not these higher motives than taking subjects simply because one is assigned them by a taskmaster or because they are in a required curriculum?

Motivation Through Results.—While every one gets some exhilaration from exercise, it is results that motivate. The great mainspring to action in all orders of life is interest in achievement—in results. We must not be led to believe that school children will accept cheerfully all assigned tasks because of an inevitable interest in action—in processes. It is only when we cause them to feel a worth in the result that we secure genuine and continuous interest. School activities are frequently too far removed from reality. Children like to do and accomplish real work. A boy in a kindergarten said: "I don't want to play drive nails. I want to drive some real nails with a real hammer!" Too much occupation for children is playing at driving nails. Every one is more interested in results than in processes of securing results. The processes are only means to ends. All nature has been interested in securing results. Educational theory, however, has often erroneously conceived educational values to lie in the processes. It is said that the process of learning the arithmetic, the algebra, or the Latin are the important things; the resulting knowledge of arithmetic, algebra, and Latin are inconsequential, compared with the value of the processes.

Learning, therefore, is often a purely formal affair. In the chapter on formal discipline this theory is critically examined and shown to be untenable. Even in manual training attempts have been made to exalt the value of the process and to minimize the value of products. A little observation of pupils engaged in manual training should show that the child is primarily interested in the product. The sled, the box, the Christmas present he is constructing make the process worth while. Let him be asked to go through purely formal "exercises" without making anything, and note the dwindling interest.

Can we not regenerate all our subjects of instruction by putting real, worthful results into the foreground? Pupils should write real letters, work concrete real problems growing out of spontaneous activities, study problems in civics connected with everyday life, make geography, like charity, begin at home, read to know, recite to give information. In all teaching have the work spring out of the demands of life and be made to contribute to them. The boy who regards algebra and Latin as mysteries evolved merely for schoolboy occupation is never interested; but the boy who glimpses that algebra will unlock hidden secrets in electricity or that Latin may contribute to his efficiency as a lawyer will glow with enthusiasm over the results and is willing to master the processes.

Interest Through Experience.—It often happens that pupils are not interested in a subject when it is first begun, but after they have pursued it for a time it becomes pleasurable to them. This is to be expected. We are really interested only in those things about which we know something. Interest is cumulative. The more we know, the deeper usually becomes our interest. As soon as one's knowledge becomes a part of one's mental system; when all activities of life are fitted into this system; when one begins to shape all thoughts, feelings, and actions by this knowledge; then one may be said to be really interested. The business man who sees stocks in everything, the doctor who constantly discovers cases to support

his medical theories, the sociologist who discerns a sign of a great social movement in every individual's act, is really interested. I say to my students: "You will not be good teachers until your days and nights, your waking hours and your dreams are filled with thoughts of your work, and you are possessed with a burning desire to better your work, until you have thought about it enough to make it the great passion of your life—completely living that life which you have elected as an ideal." No one ever arrives at that stage of burning zeal and enthusiasm without first having studied long and deeply.

The subject-matter must be adapted to the age, capacities, and apperceptive insight of the child. Even in the university the same principle should be observed. Where entire freedom of choice obtains, the student is as liable to elect teachers as subjects, and often selects subjects for which he has no proper preparation. Every elective should have certain prerequisites for its pursuit. We want the subject to take a vital hold upon the individual; he should form desires to pursue it; it should become a part of him, so that it influences conduct. The arithmetic that is never applied in daily life spontaneously by the pupil is of little account; the history that is never drawn upon to measure present human conduct has not borne proper fruit.

If a child does not become readily interested in a given lesson, it is better to seek something else. If he has sufficient apperception for the given lesson, his readiness to be influenced by suggestion will easily develop the proper attitude. Spencer says: "This need for perpetual telling is the result of our stupidity, not of the child's. We drag it away from the facts in which it is interested, and which it is actively assimilating of itself; we put before it facts far too complex for it to understand, and therefore distasteful to it." (Spencer, *Education*, p. 126.)

It is of great importance that the child should form interests through the subject-matter of instruction which may develop into permanent life interests. In this view the char-

acter of the subject-matter of instruction becomes of the highest importance. Purely formal instruction in subjects that do not touch life cannot develop proper interests in life. Formal rules of language, grammar, or arithmetic cannot teach the golden rule. Hence the value of literature, history, and other humanistic studies. Interest should remain a permanent and abiding attitude even after the particular knowledge has been obliterated from the mind.

Interest Through Imitation.—Imitation and suggestion are very potent means of securing interest among children. They instinctively exhibit first curiosity and then genuine delight in what interests their mates. They are also responsive to bursts of enthusiasm on the part of those whom they respect and admire. Parents and teachers who cannot warm up over the activities that appeal to child life are lacking in very essential qualities of child leadership. One of the highest compliments that can be paid a teacher is that he seems like a student in his eagerness. Leadership is more to be desired than policemanship or taskmastership. "Teaching is really a matter of contagion rather than instruction. His (the child's) leader must therefore be a person of character and self-control. He loves his leader and wants to do for him. His leader must be a person of ideals who can offer him good and true things to do." (Forbush, *Pedagogical Seminary*, 7 : 341.) It is necessary to distinguish carefully between genuine interests and spurious ones engendered through imitation. Often pupils think they are interested in a subject simply because their acquaintances have the same attitude toward the subject. True interest can only develop through knowledge. Consequently it is only after the pupil has given a subject a fair trial that we may know whether or not he is interested.

Spontaneity.—We should seek to have the child act spontaneously as far as possible. This does not preclude influencing him by suggestion and guidance toward a desirable line of action. But the child should desire to reach certain ends or conquer difficulties for himself. When the child's

self-activity carries him forward, it is astonishing what results may be accomplished. They are incomparable with those obtained through doing prescribed tasks. "The spontaneous activity to which children are thus prone is simply the pursuit of those pleasures which the healthful exercise of the faculties gives. . . . Children should be led to make their own investigations and to draw their own inferences. They should be *told* as little as possible, and induced to discover as much as possible." (Spencer, *op. cit.*, pp. 124, 127.)

There are thousands of ways in which their interests may be aroused in discovering things for themselves and accomplishing results unaided. Normal, active children will even resent help. They say: "I want to do that myself." They prove this when building with their blocks, when playing their games, in the various manual activities, and sometimes even in the school arts. Who has not seen children delighted at discovering analogies in forms of objects and in the use of things? Discovering the spelling and pronunciation of words, for example, may be made a most delightful exercise. The study of plant and animal life affords great opportunities for the independent discovery of analogies. The child is essentially an analogical reasoner. There is ample opportunity in all subjects to have pupils work out independent conclusions. Even in history, which is so often memorized in a purely mechanical manner, questions may be propounded which invite independent judgment. For example, have the class answer such questions as the following: Should Gates have been commander-in-chief? Should Fitz-John Porter have been court-martialed? Was Hayes elected President? Was the purchase of Louisiana unconstitutional? Was the purchase of Alaska advantageous? Was the Cuban War justifiable? A similar procedure in literature would infuse new life into what is often dry and uninteresting.

Importance of Responsibility.—A definite aim should be inculcated very early in the child's mind. This aim may and should undergo metamorphosis with added experience. The boy's aim should be more immediate than his father's, to be

sure, but an aim he should have and that should be tenaciously striven for. No child should grow up irresponsible. Responsibility promotes interest and gives zest to life. The main differences between country and city bred children do not result because of differing amounts of ozone which they have inspired, but because of the more permanent interest in tasks and the greater fidelity to responsibilities placed upon the country children. That is one potent reason why so many great men have been reared on the farm. Because of the relief from all continuous tasks and from all responsibilities, the city boy often does not learn to be interested in performing *duties*. He is apt to be interested in the things of the moment, those which compel attention, those which are entertaining or amusing. The country boy is early habituated to perform tasks because they are duties. Work must be done, some one must perform it. His father works steadily. The hay *must* be cut, or spoil; the stock must be fed, or go hungry; the fence must be mended, or danger will result to the crops; wood must be cut and brought in, or dinner will be late. He hears every one say *must*, and through habituation to work and reflection upon consequences, he, too, learns to say that "this and that *must* be done, and they seem to fall to me; I *must* do them."

The city child unfortunately misses all this. He seldom feels the impelling "I must," except "I must get my lessons, or get punished." But he is seldom taught to be on the lookout for work. The assigned lesson over, he casts himself adrift, oftentimes to be caught in currents that lead to mischief. The country child has few playmates and few playthings; the city child has so many that he is surfeited with them and ceases to be interested in them. Compare the boy who makes a sled with one who has his sled and all other toys bought for him. The one is interested in *achieving* an *end*, the other is merely temporarily amused. Compare the boy who makes a collection of eggs with the one who merely goes to the museum. The one who collects will have deeper, healthier interests than the one who can go at any time, but

who has never attempted to make a miniature museum. The girl who has some part in making her own dolls secures a satisfaction that is unapproachable by the *poor rich* child who is merely a spectator. The pleasure of being a spectator in these directions is almost as proportionally undesirable as being a spectator instead of a participant in a feast.

On the farm it is comparatively easy to promote interests in a variety of directions. With little suggestion the child can be made to have a deep interest in animals and plants. One of the surest ways to launch these interests is to make the child a copartner, a profit-sharer. Had farmers any pedagogical tact, there would be little difficulty in keeping boys on the farm. Could certain patches of ground be set apart for the boys' own use, could certain animals be given them to care for and to own, they would not only be interested in those projects but they would become identified with the interests of the whole farm. There, as in every walk of life, no one wants to be merely a spectator. Of course the social question enters here, but the same rule should apply there. Make the young people copartners in working out better social relations. Prescription without co-operation is fatal here as elsewhere. No greater enthusiasm has ever been kindled in my own life than in the co-operative attempts at evolving a country lyceum, and in the attempt to work out with my father better methods of raising certain crops.

One of the gravest mistakes in the present-day education from the kindergarten through the university is the failure to impress thoroughly the duty of individual responsibility. It has come about largely through a misinterpretation of the doctrine of interest and the belief that the child develops a better type of will when freed from restraint. Freedom from restraint has come to mean absolvence from duties and from training. On every hand the doctrine is spread that we ought to follow the lead of the child's interest. This is good pedagogy when we follow a child's interest which has come about through a healthy and normal development. But there are many perverted and unhealthful interests. It is

manifestly wrong to accede to the child's wishes in such cases, simply because he is interested. Moreover, many apparent interests are mere passing whims. It is as important that the parent and teacher create interest as that they permit children to follow their own interests. They should instil into the minds of children that it is a duty incumbent on them to be interested in right, important, and uplifting things.

Co-operation of parents with teachers is one of the surest means of producing genuine interest in school work. The parent who does not know what his children are doing every day in school must not be surprised if some day the child plays truant or becomes apathetic toward his studies. I have known few cases where parents were intelligently interested in the child's progress in which the child himself was not likewise interested. Many fathers are too absorbed in their banks, their merchandise, their railroad, to know anything about their children. They scarcely ever see them by daylight and never have time to talk with them and really know what they are doing. One-half the interest and concern that many a father accords to his trotting-horse, his yacht, his automobile, his favorite baseball team, accorded to an identification of interests with his children would work wonders in child-saving. No wonder that the indictment is sometimes made that many men are successful in all kinds of business except rearing boys and girls properly.

Interest in Self-Improvement.—Boys ought to be taught to be as absorbed and interested in their school work as they would be if working for wages and trying to capture a bank presidency. School work is apt to be done as prescribed tasks which it is deemed honorable to shirk if possible. Parents should take the same pains to have children please others and to succeed in school as if in a mercantile establishment. A false code of school ethics has sprung up. Children should be taught to do with all their mind and will and strength whatever seems right to do. Pitch in and interest follows. No one will ever get up a white heat of interest by waiting for interest to come before beginning a task. Assume the atti-

tude of interest and interest will follow, is the Lange-James law of emotion.

Is not irresponsibility manifest in all grades of school? Is it not manifest in the university? And is it not discernible in the home? The child goes to school and performs his school tasks because he is entertained, and as soon as the teacher fails as an entertainer the child says mentally that because the teacher is not interesting he is not obliged to be attentive. His assigned work over, he is in mischief. He has not been taught to set himself to work. In the high schools and colleges the youth often puts himself in a contest with the teacher, saying: "Now if you entertain me, I'll keep awake and I'll attend your classes. If not, I'll bring discredit upon you by going to sleep, or I'll elect a course somewhere else." The student who does not maintain an interest by his own initiative ought not to be in class. The adult who goes to sleep during a lecture or in church is in the kindergarten stage and ought to be in the kindergarten. His presence ought to be evidence that he is to co-operate. Duty is not taught best through preaching. The habit of attending to regularly recurring work is what teaches duty, just as the habit of being polite teaches one to be polite.

Pupils are virtually taught that they are absolved from all personal responsibility and are to look to the teacher to create all interest. This is a pernicious doctrine. I have watched the career of several boys who have grown up with this idea firmly implanted in their minds. To all advice that they ought to pitch in because there was a personal obligation resting upon them to help their parents and also to make something of themselves, their only answer was: "I don't have to because I don't like that." They have reached middle life and are still seeking something which they will like. They have drifted from occupation to occupation, and from occupation to idleness, and nothing, not even idleness, has been more than momentarily interesting. This is the inevitable result of making pleasure the sole object of life. The pleasure-seeker is the least interested and most miserable being alive.

Teach the children responsibility and obligation to self and to society and unflagging persistence in accomplishing in the best way "whatsoever their hands find to do," and the matter of interest will in adult life largely care for itself.

With the wealth of well-written books now accessible high-school and college students ought to progress and maintain healthy interests in their studies, even with very indifferent teachers. This is not an apology for poor teaching. The teacher's duty in helping to maintain interest is in no way lessened. But it takes two parties to maintain good class-work—a good teacher and a responsive, responsible class. An irresponsible-minded class becomes much like the kindergarten children, even under good tuition. The pupil must learn that interest comes through aim, responsibility, responsiveness, and apperception.

Did it ever occur to you how unnecessarily long pupils may pursue some subjects and not learn them well after all? Take penmanship, for example. Most schools devote to this subject one period of fifteen or twenty minutes daily for eight or nine years, and then not half of the pupils can write a legible, rapid hand. At one time I began to reflect on the wasteful, half-hearted, abortive process. I watched the daily evolutions of these young soldiers going through the aimless (to them) manœuvres. They expected that they would have to do the same for eight years, anyway. Time enough later on to improve. Do as little as possible now. I tried an experiment. The pupils were told that penmanship would be a required exercise until they could write a plain, legible hand with fair rapidity. As soon as this degree of proficiency could be attained and manifested in their usual work, each one should be excused. The results were amazing. Soon there were self-seeking candidates for the privilege of being excused. They began to coach themselves. They now had a *desirable aim which enlisted their deepest interest.* They asked for information and help instead of being unwilling recipients. The majority of the pupils were excused in either the fourth or fifth grades, and seldom was one demoted for further dere-

liction. A similar plan was adopted in spelling, with splendid results. They had no longer to be taught. Their interests prompted them to teach themselves. Whenever the individual instead of the class was made the basis for promotion, I found largely similar results.

To say that we ought to follow the lead of a child's interest is good pedagogy, provided his interests are healthy and have come about through normal development. But there are many unhealthy and perverted interests. It is manifestly wrong to obey these. As with instincts, some are good, others bad. The good ones are to be nourished, the bad stifled or diverted. It is not more safe to follow the child's interests than his appetites for food. Left entirely to himself in the matter, he sometimes selects pickles and jam, or superabundance of starches, rather than those things that are nutritious.

It is not a question of having the child interested, but, more important, of having him interested in worthy things. It is a mistake to think that, at all events, children must be happy. Happiness is desirable, but not the only desideratum. Better be less happy and more serious, if occupied with right thoughts and actions, than happy in evil or idle things. Better be serious in work than happy in sin and wickedness. Momentary pleasures in childhood do not insure lifelong happiness. The child should learn early that his own selfish gratification must often be subordinated to the welfare of others—the family and society. As with instincts, we cannot trust all to the child. Rightly constituted authority must set up ideals and standards toward which individuals and society must be guided, and sometimes even coerced. To become deeply interested in things that are worthy and ennobling is of more value than learning. The right attitude toward life is of the greatest importance. Too many are secretly or openly interested in ignoble things.

Adolescence and Life-Interests.—It is during adolescence, that period of enlarged vision and superabundant life, that interests and enthusiasms are at a white heat. Out of the manifold interests then dominant some will become crystal-

lized into the permanent life-interests. The stamp which is impressed upon the youthful life will become fixed forever. Just as conversions rarely occur in maturity, just as a criminal usually enters upon his career in the morning of life, so lives of usefulness, happiness, and virtue are launched while the heart is yet young.

President Eliot wrote:

> Any one who has read many biographies will have perceived that the guiding enthusiasm of a life often springs early into view and that this is almost always the case in the most effective human beings. The youth has a vision of the life he would like to live, of the service he would choose to render, of the power he would prefer to exercise, and for fifty years he pursues this vision. In almost all great men the leading idea of the life is caught early, or a principle or thesis comes to mind during youth which the entire adult life is too short to develop thoroughly. (*Journal of Pedagogy*, 17, 112.)

It is seldom that an entirely new occupation is entered upon with success after middle life. After that a splendid superstructure may be erected, but the foundations must have been laid in early life. Although young shoulders should not become bowed down by an overweening sense of responsibility, yet it is sinful not to impress the young with the importance of the morning of life. The old adage that it is never too late to mend should be replaced by the one that it is ever too late to become what one might have been, if an opportunity has been allowed to slip. Students should early recognize the importance of making the most of the morning of life. Biologists have come to recognize the economic value of the period of infancy. This is a time of plasticity, a time when the individual can be moulded and modified; in other words, educated. The longer the period of infancy, the higher the degree of educability. The newly hatched chick has a short period of infancy. On emerging from the egg it can perform almost all the activities which it will ever be able to perform. It has very little to learn and very little time in which to learn, very little possibility of learning. The young dog has more to learn, a longer season in which to learn it, and larger

possibilities of acquiring new activities. The human being has the longest period of infancy. Infancy is not alone the period when the child is in the cradle. Biologically it includes all of life from birth to maturity. After this period the possibilities of education grow less and less.

Brain-workers inaugurate their best work between the ages of 25 and 45; before that they are preparing for work, after that their work, no matter how extensive, is largely routine. Lawyers and physicians do much of their practice after 40, but the learning was accomplished before 40 or 45. Successful merchants lay the foundations for wealth and success in youth and middle life. The great men that we know are all old men; but the foundations for their greatness were laid when they were young. Philosophers have founded and announced their systems in youth and early manhood; divines and religious teachers have originated their creeds and have been most effective as preachers in early manhood. Statesmen have projected their greatest acts of legislation, diplomacy, and reform in early life. In the morning of life scientists have wrought out the data and practically formulated their theories; generals and admirals have gained their greatest victories; lawyers have paved the way for leadership at the bar; physicians have laid the groundwork for their greatest discoveries; poets and artists and musicians have planned and in many instances executed their greatest masterpieces; engineers have planned the greatest monuments.

A few instances may be cited to show that the world's leaders in all lines of progress have either become illustrious early in life or have done the thinking which they have reserved for later expression. Dickens began early to write. *The Pickwick Papers* was produced at 25. The works which have immortalized his name were all produced before 40. Ruskin had completed the first part of his greatest work, *Modern Painters*, at 28. Shakespeare had produced some of his immortal plays before 36. Bunyan had depicted man's cycles of hopes, sorrows, and despair before 35. Byron and Burns died at 36, Keats at 25, Marlowe at 29, and Shelley at

30. Coleridge wrote his "Ancient Mariner" at 25, Goethe and Victor Hugo had produced works of lasting value at 20. If Carlyle had died at 45 the loss to literature would not have been great. Lord Bacon had begun to philosophize at 16, and at 36 had published twelve of his essays. At 29 Descartes began to outline his system, and at 41 to publish it. Schelling was a renowned university professor of philosophy at 28. Emerson expressed the essence of his philosophy between 25 and 40. His essays first appeared at 38, though they had been uppermost in his thoughts from early manhood.

Edison was a young inventor. In fact, all inventors are young. Eli Whitney was noted at 27, Colt at 21, Fulton at 28, Dreyse at 42, Graefe at 25. Alexander the Great had conquered Greece at 21, Persia at 25, and had completed his history at 33. Julius Cæsar began to take part in the great drama for which he is remembered at 17, Hannibal at 29, William the Conqueror before 20, Cromwell before 30, Marlborough at 32, Napoleon at 25, Wellington at 25, Nelson at 39. Among artists and sculptors about three out of four have shown decided promise before 15. Michelangelo produced great works by 19. Raphael and Van Dyck painted famous pictures before reaching their majority. Rembrandt was famous at 24. Among musicians we may cite Mozart, Beethoven, Mendelssohn, Schubert, and Schumann as real producers before 20; in fact, each produced something original by 13.

If we turn to muscle-workers we find that early in life they reach their maximum, and that their capacity is either stationary or has begun to decline at 35 or 40. This is true of all athletes, oarsmen, pedestrians, lumbermen, guides, farmers, and soldiers. Beard says: "To get the best soldiers we must rob neither the cradle nor the grave, but select from those decades when the best brain-work of the world is done." It has been statistically determined by Sir Crichton Browne in England that among the handicrafts of weaving, button-making, and pottery-making there is an increase in proficiency from 17 to 30, when the maximum is attained. From

30 to 45 there is an equilibrium, and after that a gradual decline.

We are therefore strongly admonished that the most possible should be made of early life. Youth is the time of great opportunities which come but once. We build for eternity. The youth cannot sow wild oats and expect to reap a character of noble manhood or womanhood. "Whatsoever a man soweth that shall he also reap." Luther once said: "If a man is not handsome at 20, strong at 30, learned at 40, and rich at 50, he will never be handsome, strong, learned, or rich in the world."

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Why should children obey their parents and teachers? 2. Why should high-school pupils obey the rules of the school? 3. Why should adults obey the laws of the state? 4. What should be the motive causing a child to learn to read? 5. Mention some proper incentives that would stimulate children to learn arithmetic, composition, drawing. 6. How would you get high-school pupils to be interested in their school? 7. Indicate the motivation values of extracurricular school activities. 8. How may pupils be motivated to study more diligently? 9. What is supervised study? Merits and demerits of supervised study?

References for Further Reading

1. Bolton, *Principles of Education*, chap. XXVI.
2. Colvin, *The Learning Process*, chap. XVII.
3. Dewey, *Schools of To-morrow*, chaps. II, III, IV, VI.
4. Dewey, *The School and Society*, chap. II.
5. James, *Talks to Teachers on Psychology and Life's Ideals*, chap. X.
6. Meriam, *Child Life and the Curriculum*, chap. IX.
7. Miller, *Directing Study*, chap. V.
8. O'Shea, *Mental Development and Education*, chap. XI.
9. Parker, *Methods of Teaching in High Schools*, chap. XIV.
10. Wilson, *Motivation of School Work.* Entire book.

CHAPTER XII

CONSERVATION OF EXPERIENCE: MEMORY

What Is Memory?—No attempt will be made to define memory in a formal fashion. It is usually thought of as *recalling ideas* that have been previously learned. Usually also it is thought of as the recall of particular *words*. Memory is, however, not limited to *recall*. That is just one phase of the process, *remembering*. We may regard memory as including four factors, the so-called "four R's"—*registration*, *retention*, *recall* or *remembering*, and *recognition*. Or we might think of it as comprising two factors—*conservation* and *recall*. Certainly the conserving or retaining is as much a part of memory as recall or remembering. Again, memory is not limited to words or even ideas. Muscular experiences must be learned, retained, and reproduced, as well as words and ideas.

Just what takes place in the mind or in the body in the process of memory is not very well understood. That some change takes place and persists is certain because of subsequent behavior. We also know that modifications in nerve-cells take place when continued long enough. The brain and other parts of the nervous system increase in size and complexity through experience. If nerve connections, as in association paths, are not exercised they do not develop, but degenerate. The study of the brain of Laura Bridgman showed that the parts exercised developed and those that were unexercised degenerated. Venn, an English psychologist, measured the heads of some students at the time of entering Cambridge University and after four years of training. He also measured the heads of a group of non-students at corresponding ages, and found that the heads of the Cambridge students grew more than the heads of the non-university group. This

shows that the effects of learning seemed to be conserved in a physical way. Scars from wounds seem to indicate a similar conservation of bodily modifications. From the standpoint of mind we know only by subsequent ideas and behavior that we have retained something from previous experiences.

We are apt to think about memory in a very artificial way because we have usually associated the term with the learning of some particular formal expressions, like rules, definitions, or formulas. But a moment's reflection will show that only a small part of our everyday knowledge is of that type. Unfortunately, the school seems to emphasize that kind and to omit the kind that we use every day outside of school and after school-days are over. What knowledge have you used to-day apart from school work? You may have driven an automobile, gone to a part of the city which you previously knew, greeted an old acquaintance, picked out a woollen garment at the store, advised a friend not to invest in certain property, won a game of tennis, read the newspaper and criticised some of the opinions recorded, voted the Republican or Democratic ticket at the primaries, written a letter to some of your relatives, or looked up a word in the dictionary. Now, how did you learn to shift gear in the auto so that you could do (recall) that to-day? How could you remember your acquaintance, the proper qualities of the woollen garments, whether to vote the Republican or the Democratic ticket, or how to consult the dictionary?

If much more of school work dealt with everyday things and were learned in a more natural everyday way, there would be much less of complaint about poor memories. When things are learned through doing, through natural relations, and gone over from many angles until they are fully comprehended, there is no difficulty in remembering them.

Physical Basis of Memory.—The property of retention of impressions is possessed by all living tissues. In a certain sense we might say that even inorganic matter sometimes possesses memory. There are many analogues both of registration and retention in purely physical substances. If a

piece of white paper on which a knife is placed is exposed to the actinic rays of the sun, it will, if kept in the dark, preserve the image of the knife for years. The photographer's sensitive plate records and retains impressions in a similar manner. The ocean which has its surface ruffled can never have identically the same molecular structure that it previously possessed. "Every impression," says Delbœuf, "leaves a certain ineffaceable trace; that is to say, molecules once disarranged and forced to vibrate in a different way cannot return exactly to their primitive state. If I brush the surface of water at rest with a feather, the liquid will not take again the form which it had before. It may present a smooth surface, but molecules will have changed places, and an eye of sufficient power would see traces of the passage of the feather. Organic molecules acquire a greater or less degree of aptitude for submitting to disarrangement. No doubt, if this same exterior force did not again act upon the same molecules, they would tend to return to their natural form; but it is far otherwise if the action is several times repeated. In this case they lose, little by little, the power of returning to their original form, and become more and more closely identified with that which is forced upon them, until this becomes natural in its turn, and they again obey the least cause that will set them in vibration." (*Théorie générale de la sensibilité*, p. 60.)

Dissolve a crystalline salt, say sodium chloride, and then let it recrystallize. The crystals will not resume the same positions relative to each other, but the crystals themselves will assume exactly the same geometrical form as previously. Water crystallizes in definite forms. Why is this? Who shall say that it is not at least a form of heredity? James quotes M. Leon Dumont, who says that inorganic substances and dead tissues *form* habits.

Every one knows how a garment, after being worn a certain time, clings to the shape of the body better than when it was new; there has been a change in the tissue, and this change is a new habit of cohesion. A lock works better after being used some time; at the outset more

force was required to overcome certain roughnesses in the mechanism. The overcoming of their resistance is a phenomenon of habituation. It costs less trouble to fold a paper when it has been folded already. . . . The sounds of a violin improve by use in the hands of an able artist, because the fibres of the wood at last contract habits of vibration conformed to harmonic relations. (James, *Principles of Psychology*, vol. I, p. 105.)

Analogy of the Phonograph.—Lloyd Morgan compares analogically retention in the phonograph to physiological retention.

When we speak into a phonograph the tones of our voice are not hidden away in, and retained by, the cylinder of the instrument; but the wax or other material is indented, as a result of the incidence of the sound-waves, in such a way that it is capable of reproducing similar sound-waves at a subsequent time. So, too, the brain tissue is so modified by the nervous disturbances which are the accompaniments of an impression that, under appropriate neural conditions, they tend to reproduce similar nervous disturbances which are accompanied in consciousness by a reinstatement of the impressions in the form of an idea. It is in this sense only that we may speak of the retention of ideas. . . . The ideas as such have ceased to exist; but the brain structure has been modified in such a way that under appropriate conditions similar ideas will be again produced. (*Introduction to Comparative Psychology*, p. 106.)

The great bulk of our memories are of the physical and physiological types. The results of our behavior are recorded in our nerve-cells, muscles, and other tissues, as well as in the mind. We develop intricate tissues of habits. These enable us to re-do a multitude of things without consciously recalling just what we are to do. When we walk, dance, swim, or shift gear in the automobile we do not need to revive verbal memories of what we are to accomplish. In fact, it is better that we do not. The actions are more expeditiously reinstated by means of the reflex mechanisms than by conscious recall.

Although the physical basis of memory has been emphasized, it should not be forgotten that there is such a fact as mental life. While plants have no mental life and the life of lower animals is largely physical and physiological, not all of

life is included in muscular reflexes or in physiological and chemical reactions. The knowledge of all these is mental, and that is the chief field of psychology.

Retention.—In a certain sense everything that is experienced is retained. Of course we may not be able to recall it, but it modifies our subsequent behavior. From the biological standpoint we are led to believe that every impression leaves its ineffaceable trace. Who could pass an examination upon the Sunday-school lessons, upon the good counsels of parents, teachers, and friends? Even though the recall of specific facts and precepts is impossible, every one of us behaves differently because of all previous experiences. This ought to encourage teachers. In spite of the disappointing examinations passed by our pupils, we may be comforted by the implicit belief that the large ideas and the worthy ideals which we have helped them to gain will be permanent influences in their character.

Individual Differences.—There are very great differences of memory among individuals. There are persons who acquire readily but forget quickly; those that acquire with difficulty, but retain accurately and tenaciously. Again, there are fortunate persons who acquire easily and retain with great persistence and fidelity, as well as some who work hard to acquire only to be chagrined on having what is learned evaporate almost as soon as learned. When one remembers things learned through a given sense better than what is learned through the other senses, we say that he has a certain "type" of memory. There are types of memory corresponding to each of the senses. Some persons possess one type, some another. Again, there are persons who have memories that vary within the realm of a given sense. There are also all degrees of variations, from the special power of remembering remarkably certain words, certain forms, certain sounds, or certain colors, up to the very exaggerated cases which we find in abnormal persons, or the mathematical, musical, and other "prodigies."

There are also differences in the same individual at differ-

ent stages of development. Children are usually thought to have better memories than adults. This view is hardly correct, however. Children's memories are different from adults'. Children acquire even mechanical associations more slowly than adults. They retain mechanical associations better when once learned, but adults retain thoughtful associations better. Both the power of registering and retaining thoughtfully increase up to about 25 years. The powers are relatively stationary then until about 50, when a gradual decline sets in. These various differences suggest a recognition of different methods of teaching persons of different ages, and also an adaptation of means and methods for persons of different memory types.

In order to adjust the work of the school to the different stages of growth it is important to understand the characteristics of memory at the various ages and stages of growth. The memory of the child is of the mechanical or serial type. The child from 6 to 10 can learn nonsense rhymes and jingles nearly as well as at a later age. A great many persons, in fact, in later life excuse themselves by saying that their "memories are not as good as they used to be." They mean, of course, their mechanical memories, as manifested by their facility in learning poetry, dates, nonsense rhymes, or jingles.

Should Everything Be Remembered?—Some people think they would like to be able to recall everything they have ever learned. They think that would mean a highly trained mind. But would it be desirable to recall every experience that one has had? Would it not be exceedingly inconvenient and cumbersome if every experience that has ever been associated with a given experience should be recalled every time the given one came into consciousness? What an immense amount of time would be wasted in recalling trivial and unimportant details. Remember that the unimportant details are just as much a part of the experience as the significant factors. It is fortunate that we are able to select the important and significant factors in our experiences and cast into the scrap-heap those items which are useless. Some one has

aptly characterized memory as our "forgetter." A really good memory forgets the unimportant details. Most of us would gladly forget a large part of our past lives. In commenting on the type of mind which recalls with extreme fidelity every association, James says (*Psychology*, vol. I, p. 571):

> Perhaps as successful a rendering as any of this mental type is the character of Miss Bates in Miss Austen's "Emma." Hear how she redintegrates:
>
> "But where could *you* hear it?" cried Miss Bates. "Where could you possibly hear it, Mr. Knightley? For it is not five minutes since I received Mrs. Cole's note—no, it cannot be more than five—or at least ten—for I had got my bonnet and spencer on, just ready to come out—I was only gone down to speak to Patty again about the pork—Jane was standing in the passage—were not you, Jane?—for my mother was so afraid that we had not any salting-pan large enough. So I said I would go down and see, and Jane said: 'Shall I go down instead? for I think you have a little cold, and Patty has been washing in the kitchen.' 'Oh, my dear,' said I—well, and just then came the note. A Miss Hawkins—that's all I know—a Miss Hawkins, of Bath. But, Mr. Knightley, how could you possibly have heard it? For the very moment Mr. Cole told Mrs. Cole of it, she sat down and wrote to me. A Miss Hawkins——"

Memory Training.—How to train and improve memory is a theme upon which volumes have been written. Some of the ancients devised systems of mnemonics for memory training, and such systems have been in vogue to the present time. The magazines are full of advertisements of courses of lessons and books on memory systems. "Stop Forgetting!" "Get a Steel Trap Memory!" "Increase Your Efficiency!" are familiar "ads" in the popular magazines.

Because of the remarkable success of psychology in the army a deluge of books on psychology has been published. "Characterology" and "Character Reading at a Glance" and other popular and often populous lectures are being given. Most of these books and these lectures are given by quacks and charlatans. Upon no other topic is more written by these pseudoscientists than upon memory. Most of these and

other so-called "memory systems" teach that the way to improve memory is by memory gymnastics.

Upon few other technical questions is the layman so willing to deliver opinions as upon methods of improving memory. He does not feel it hazardous to do so, but regards his conclusions as incontrovertible. The usual advice is to memorize much, verbatim and mechanically. Set apart a portion of every day for committing verses, proverbs, speeches, or strings of dates. It is asserted that the gymnastics thus used will strengthen the memory, not only in the particular direction, but also equally as much in all other directions. It is assumed that *the memory* is a general power, capable of memorizing anything when once developed. On this theory "the memory organ" might be likened to a muscle, the fibre of which can be strengthened by general gymnastics. Let us investigate to ascertain the facts which have a bearing upon the question.

Fortunately it is possible to submit the question to experimental tests and not leave it in the realm of mere opinion. The test is rather simple in character, although demanding care, patience, and persistence in its performance. The steps are as follows:

1. Test the ability to memorize a given kind of material *before taking* training.
2. Practice in memorizing a *totally different* kind of material. This should be continued for a considerable length of time, say two or three months.
3. Test on the original kind of material *after taking* the practice.
4. Compare the results in Tests 1 and 3.

EXPERIMENTAL EVIDENCE

The first experiment of this kind was performed by Professor James of Harvard, about 1890. James's interesting account of the experiment was in the following words (*Psychology*, vol. I, p. 666):

In order to test the opinion so confidently expressed in the text, I have tried to see whether a certain amount of daily training in learning

poetry by heart will shorten the time it takes to learn an entirely different kind of poetry. During 8 successive days I learned 158 lines of Victor Hugo's "Satyr." The total number of minutes required for this was $131\frac{5}{6}$—it should be said that I had learned nothing by heart for many years. I then, working for 20-odd minutes daily, learned the entire first book of "Paradise Lost," occupying 38 days in the process. After this training I went back to Victor Hugo's poem and found that 158 additional lines (divided exactly as on the former occasion) took me $151\frac{1}{2}$ minutes. In other words, I committed my Victor Hugo to memory before the training at the rate of a line in 50 seconds, after the training at the rate of a line in 57 seconds, just the opposite result from that which the popular view would lead one to expect. But as I was perceptibly fagged with other work at the time of the second batch of Victor Hugo, I thought that might explain the retardation; so I persuaded several other persons to repeat the test.

Doctor W. H. Burnham, who tried the same method, learned for 8 days previous to training 16 lines of "In Memoriam" each day. This required 14 to 17 minutes daily, average $14\frac{3}{4}$ minutes. As training he committed daily for 26 consecutive days Schiller's translation of the second book of the "Æneid." This afforded an entirely different kind of material from the preliminary test. Returning to "In Memoriam," he found the average time for 16 lines to be $14\frac{27}{48}$ minutes—maximum 20, minimum 10. Mr. E. A. Pease made a preliminary test on "Idylls of the King," then trained himself on "Paradise Lost" (length of time and daily amount should be given but are not). The average time for a given number of lines in the 6 days preliminary to the training was $14\frac{34}{60}$ minutes, for the test after training, $14\frac{55}{60}$.

In order to bring the matter before my students in a concrete way, I persuaded two of them to undertake a series of experiments, covering in one case thirty-five days and in the other fifty days. Five days in each case were taken for the preliminary tests, five for the final tests for comparison, and twenty-five and forty days respectively for the drill. The preliminary tests consisted in the memorizing of miscellaneous matter, such as lists of nonsense syllables, lists of figures, selections of poetry, pieces of prose of varying degrees of difficulty, one being from Harper's *Fourth Reader* and the

other from Hering's *Memory*, a list of twenty titles of unfamiliar books, and the names on a series of bottles holding chemical reagents. Each test was concluded as soon as any fatigue was noticeable. They thus varied somewhat in length. Only one test of a kind was taken at a given sitting, and the tests were throughout so varied and unexpected in character to the student that there was no possible chance for the effects of practice to enter into them. (In James's tests it seems as if practice on the preliminaries and finals might affect the results. He discredits two other series recorded by him, in which the preliminary practice and finals occupied fifteen and sixteen days respectively. See *Principles of Psychology*, I, p. 667.) Both of the students were unfamiliar with chemical nomenclature, and the labels were partly in words and partly in symbols, *e. g.*, HNO_3 and *Hydric Acetate*. When learning the list of unfamiliar book titles, only the backs of the books were exposed, so as to shut out as many associations as possible of names with books. It was, however, rendered easier by the sizes and colors than a list merely written or pronounced. There were twenty-five nonsense syllables in each list, and the number list contained forty-seven digits, arranged so as not to be in a serial order. Each was to be learned as a separate number. Thus there were tests in which as many associations as possible were removed, lists in which as many association helps as possible were included, and then intermediate lists. (Instead of figures and letters, arbitrary characters and forms might perhaps have been given to be drawn, and arbitrary sounds might have been uttered to be reproduced. This would have excluded association still more.) A list was regarded as memorized when it could be repeated or written (as the student chose) with a minimum number of mistakes—omissions, transpositions, or substitutions. It would have been interesting to determine how much could be reproduced after certain lapses of time. This was contemplated at the beginning, but, in the press of other duties, after being only partially completed, had to be abandoned.

One of the students, after the preliminary results, trained herself for forty days by committing for twenty minutes daily parts of Tennyson's "In Memoriam," learning the introduction and seventeen sections. The other student took for her memory gymnastics thirty minutes daily of mechanical memorizing, which she was able to continue twenty-five days. She did not drill on one form of composition, but alternated, according to interest, between prose and poetry. The final tests for comparison with the preliminaries were of the same kind and amounts, and given under the same conditions as the preliminary tests. The lists of nonsense syllables, digits, book titles, and chemical labels contained the same number as in the corresponding preliminary test, and the material for continuous discourse was from the same selections as used in the preliminary test.

On comparing the results "before taking" and "after taking," and considering all conditions, both of the students voluntarily stated in written reports of the experiments that they believed James was right. In some parts of the tests subsequent to the practice, slight gains were shown. In some others losses were disclosed, and in others no changes. The gains were more numerous, but the losses greater in amount than were the gains. For example, student *A* committed 267 words of poetry in 30 minutes before practice, and only 189 words of the same selection after practice. Student *B* committed 260 words of poetry in the same period before practice, and only 200 after practice. In one case 47 digits were learned in 15½ minutes before practice, while it took only 10½ minutes after practice. Neither the gains nor losses have any special significance. The gains are more noticeable in the purely mechanical forms where methods of learning could be standardized. The variations probably represent different conditions of the learner. The gains ought to predominate over the losses, with no other influence than that of the discovery of the best methods of learning the particular kind of material. A slight gain from this source ought to be expected. Such gain would not contradict James's position.

In all of the instances where gains were shown, the students explained that they had been able to acquire a peculiar knack or trick of grouping the materials. It was also true in the same cases that more mistakes and more substitutions occurred, and the subject did not feel so sure of the results. In the cases of the book titles both students said that it happened that a few partially familiar titles came in the second list and none in the first.

Memorizing.—In former times a great deal of school work was learned verbatim and pupils recited the words of the book. As a consequence writers on psychology and educational theory have written much on methods of memorizing. To such an extent has this been true that one might think that was the only important kind of memory work. In recent years teachers have gone to the other extreme and have required almost nothing to be memorized verbatim. Very little has been written on rational methods of acquiring and retaining. In fact, most students of psychology and educational theory fail to recognize the element of memory unless the learning process deals with memorizing.

One of the questions relating to memorizing that has been widely discussed is regarding the relative efficiency of the "whole" and "part" methods. In attempting to learn a selection verbatim it is said by some that it is much more economical to read the selection clear through as many times as are necessary, than to read a part, fix that in the memory, and then memorize another part. Experiments demonstrate that to be true in case of short poems, but common sense teaches us that it is not true if the selection is very long. For example, if one were to try to memorize "Paradise Lost," *Pilgrim's Progress*, or the entire Bible, it would be absurd to read from beginning to end each time. When the principle is applied to learning the content of an entire subject, like history, psychology, or geometry, it is at once recognized that they must be learned bit by bit, and that the only rational way is to go from the part to the whole.

If a relatively short selection is to be learned, probably the

whole method is the most economical. From Pyle and Snyder's experiment the following statistics bear on this point.

LEARNING 240 LINES BY WHOLE AND PART METHODS

METHOD	NUMBER OF DAYS REQUIRED	NUMBER OF MINUTES REQUIRED
Thirty lines per day memorized, then whole reviewed till all could be recited	12	431
Three readings per day of whole till it could be recited	10	348

This experiment showed an economy of about 20 per cent by the whole method. Other experiments have given similar results. Woodworth (*Psychology*, p. 344) comments on the experiment as follows:

However, the matter is not quite so simple, as, under certain conditions, the results tend the other way. Let us consider a very different type of learning test. A "pencil maze," consisting of passages or grooves to be traced out with a pencil, while the whole thing was concealed from the subject by a screen, was so arranged that it could be divided into four parts and each part learned separately. Four squads of learners were used. Squads A and B learned the maze as a whole, squads C and D part by part. Squads A and C learned by spaced trials, two trials per day. Squad B learned the whole thing at one sitting; while squad D, which came off best of all, learned one part a day for four days, and on the fifth day learned to put the parts together. The results appear in the adjoining table, which shows the average time required to master the maze by each of the four methods.

PART AND WHOLE LEARNING, SPACED AND UNSPACED, IN THE PENCIL MAZE

From Pechstein

	SPACED TRIALS	UNSPACED TRIALS
Whole learning	A 641 seconds	B 1,250 seconds
Part learning	C 1,220 "	D 538 "

When the trials were spaced, the whole method was much the better; but when the trials were bunched, the part method was much the

better; and, on the whole, the unspaced part learning was the best of all. Thus the result stands in apparent contradiction with two accepted laws: that of the advantage of spaced learning, and that of the advantage of whole learning.

This contradiction warns us not to accept the "laws" too blindly, but rather to analyze out the factors of advantage in each method, and govern ourselves accordingly.

Even if the "whole" method were true for all kinds of memorizing, it would not be a very important principle, because outside of school very little is or should be memorized verbatim or mechanically. It is seldom that our everyday occupations require that form of memory. We learn to know our acquaintances, our business, and our pastimes in a much more natural way. The school subjects, apart from spelling, the multiplication table, and a few other activities, seldom should be learned mechanically. History, geography, and literature are great complexes of ideas and concepts, and no mere mechanical expressions can represent them.

Association in Relation to Memory.—One of the most important factors in recording experiences is that of association. It is therefore a prime factor in determining recall. For example, I see the sign "Lotta Miles," and I at once think of Kelly-Springfield tires; "Ivory Soap," and "It floats" immediately pops into my mind. These recalls have taken place because I have seen the combinations innumerable times. The establishment of these relations between experiences is termed association. Or it may be more formally defined as the *process* of establishing relations between or among experiences. It is equally true that it is the *result* of establishing relations between or among experiences. It is a *registration* process rather than a recall process.

Not all associations are mental connections. All association has a physical basis. It may be physiological, *i. e.*, be concerned with life processes like swallowing or forming other muscular habits. All our everyday habits depend upon motor reactions of a mechanical sort. Standing, walking, arranging one's clothes, opening and closing doors, avoiding

obstacles, following habitual paths, holding one's book open to read, dipping one's pen in the right bottle, using knives and forks properly, could not be carried on were these organic associations not properly established. Skill in games is reached only after effort in establishing muscular co-ordinations (associations). Once established, it is necessary to think only of the end in view to awaken the entire sequence of processes necessary to accomplish the result. Each step is the necessary stimulus to call the next step into activity. The associations formed in riding a bicycle or learning to dance are very largely physiological. Little mentality needs to be put into either act. What there is belongs to the ideomotor type. An obstruction is encountered with the bicycle. The muscles hit upon the successful method of acquiring control, and this co-ordination is remembered, not as a conscious process, because few could describe it, but it is retained as organic memory.

Such school activities as writing, drawing, oral reading, and spelling acquire perfection only after mechanical, organic associations have been definitely fixed. The learning of one's mother tongue depends upon associations (*a*) between the idea and the word, (*b*) between the sound of the word and the movement of the vocal organs in producing the sound, (*c*) between the idea and the written or printed symbol, (*d*) between the sound of the word and the written or printed symbol representing it, (*e*) between each of these and the various qualities making up the idea.

The Direction of the Association.—Associations are the basis of habits, and as in habits the activities in a chain of associations become linked together in such a way that the order becomes very definite. Everybody knows how quickly the alphabet can be repeated forward, and also that it takes longer to repeat it backward; how much longer they do not usually realize. Repeated experiments with college classes have shown me that it takes about three seconds to say it forward and thirty seconds to say it backward. Great difficulty, even tension, is experienced by most persons who try

to say it backward. Also, instead of proceeding smoothly and continuously from *Z* to *A*, they are obliged to go a little way, say to *R*, and repeat it forward. At the same time they try to build up an association in the opposite direction, and then repeat it backward. One who had committed a poem to memory would not attempt to reverse the order of words. Only a few words can be spelled backward by most of us.

The far-reaching importance of this principle is, however, too often unappreciated and violated. The teacher gives the child the combination $7 \times 8 = 56$ and is amazed when the child cannot tell that $8 \times 7 = 56$. The brightest children may reverse the combination and thus happen upon the right answer, while the rest are called stupid. It is rather a case of pedagogical blundering; 7×8 is not the same as 8×7 any more than *c-a-t* is the same as *t-a-c*. $8 + 7$ is not the same as $7 + 8$; $36 \div 9$ is not the same as $36 \div 4$; $\frac{1}{2}$ of 4 is not the same as $4 \div 2$ or $\frac{2}{4}$ of 4. To make the child see the equivalences is a part of the process. They are not usually seen by the child until pointed out.

In teaching foreign languages this principle is frequently overlooked. The usual procedure in the translation method is to have the pupil look at the foreign word and then say the English equivalent. For example, the pupil looks at the word *Knabe* and says *boy*, *Mädchen* and says *girl*, *livre* and says *book*, *le chien* and says *dog*. It is no wonder that the pupil does not learn to speak the language readily. The chain of associations has been from foreign printed symbols to native spoken words, instead of from object or idea to foreign spoken word. In many classes the pupils seldom read the German, always translating. Thus the ear never becomes accustomed to the sound of the foreign language. Still less are there associations built up between ideas, spoken foreign word and printed foreign word. While in Germany as a student I noticed that many American students always tried to take notes on the lectures (given in German, of course) in English. As a result those students never learned to

understand the lectures well. They constantly heard one language and thought another. As a result both processes were hindered. The students who went into the lectures and began taking down in German as much as possible, if only a single word in a sentence, soon became accustomed to grasp the thought and to record it in the same language. Their progress was decidedly faster than in the case of those who resorted to translation methods.

I have frequently tried the following experiment with classes: (1) A list of German words was given to be translated at sight into English. The time taken and the number of mistakes were recorded. (2) A list of English words equally long and of the same difficulty was given to be translated at sight into German. The time necessary to translate the list of German into English is always much less than when the translation is from English into German. The latter often takes twice as long and more mistakes occur. The result is a perfectly natural one. Ease and rapidity of functioning is a consequence of frequent associations. The way in which experiences are registered determines largely the manner of their recall.

Necessity of Making Associations Purposely.—In order to have things recalled it will not do to trust to chance associations that are expected to be found because things may be near together in space or time. Every day illustrations may be given to show that mere chance contiguity in space or in time is not sufficient to produce an association in the mind. A class of forty were asked to tell the number of the classroom in which they assembled three times every week. Not one was able to answer correctly. They were asked to draw a dog's foot and a hen's track as they appeared in snow or in mud. The drawings were far from accurate, some drawing three toes and some five toes for the hen's track. These were objects of frequent casual observation, but because no attention had been paid to them, no association had been formed. That the associations had not been formed was no discredit, but it shows us that in all teaching associations

must not be left to chance. By questions, by analysis, by careful explanations, and by requiring concentrated thinking, pupils must be led to form definite associations and not be passive recipients of isolated facts. Careful questioning produces new ideas, new combinations of thought, *i. e.*, new associations, thus increasing the number of suggestions and the probability of recall.

When a given idea has been associated with several others, it is of interest and importance to know which will be recalled when it comes before the mind. It is of more immediate interest to know how to weld associations so that the experiences can best be retained and recalled when needed. Although the stream of thought is to a large extent determined by chance associations, many desirable associations are not made without conscious effort. The child, for example, gains in a desultory manner many ideas about nature, art, social laws, and economic relations from his environment. The knowledge thus gained is sometimes so much overestimated that it is not deemed necessary to study these facts and phenomena in a systematic way. While environment is exceedingly potent in shaping one's ideas, we must not forget that there are many with eyes who see not, with ears who hear not. The country boy with a vast wealth of natural phenomena all about him is too often completely deaf and blind to their richness. It is not at all uncommon to find bright country boys of 16 who do not know as many birds and animals and trees and flowers and varieties of rocks and soils as the city high-school boy who early in the grades has been taught to observe those things. The country boy has wonderful possibilities, but is often without wise guidance. Hence, in order to produce associations, the more purposeful the effort the better the associations will be made.

Vividness.—Events which have come to us in so striking a manner as to transfix the attention are indelibly impressed upon the mind. An accident, the first sight of the great ocean, the first trip to a metropolis, a visit to Mammoth Cave, a descent into a coal-mine, a balloon ascension, a fright from

an encounter with wild beasts, or the railroad accident can never be forgotten by the one who has had the experience. Similarly, it is not uncommon to be put into possession of certain facts in such a way that they will never be effaced. The demonstrations in physics performed by a certain professor came back to me in great detail after the lapse of a score of years. The first wonders of experimental psychology came to me so impressively that I could tell every detail of the experiments performed many years ago. Is it not a truer function of teaching to open up the wonders of the universe, both of nature and of art, than to drill a traditional set of facts into pupils' minds?

Ideas should be made as vivid as possible in order to establish associations. The advertiser seeks to arrest the attention and compel the mind to contemplate the thing advertised. In order to do this, striking pictures, brilliant colors, bizarre figures and situations are employed. Besides being designed to compel attention, there is an attempt to set forth the most tempting features of the advertised wares. Enough is given to make us curious to know more. The good teacher is a good advertiser. Ideas are presented in striking ways and at opportune times so as to stimulate curiosity.

Attention and Association.—Though the nervous system of the child is plastic and his senses keen, yet the majority of his perceptions leave little trace. This is because he cannot concentrate all his forces upon the facts under consideration, and because his ideas do not sprout out and become related to all other germane ideas. Attention not only means the ability to focus the mind on a point, excluding extraneous ideas, but also the ability to secure a grasp on everything that can contribute. It is like the abilities of a strong executive. He must not only be able to work hard and effectively himself, but he must be able to marshal great forces to exert their utmost aid in the same direction. In a great act of attention the mind is not merely fixed in one direction, oblivious to all else, but it is searching this way and that to discover and establish all possible relations. The child's inability to attend

then is explained largely through his lack of apperceptive material. Therefore when we speak of attention as a factor in association, we mean that associations are deepened and new ones formed, thus increasing the possibility of recall. The lowest sort of attention is employed in strengthening mechanical associations, the higher in establishing thoughtful ones. The former is necessary in teaching the child to recognize word-forms, to spell, to fix the addition table and the multiplication table. As long as he is swaying about, looking out of the window, or counting his marbles, he cannot fix the word-forms. He must be brought to see with sufficient "(at) tension" to effect a change in his cerebral ganglia. On the other hand, in order to register ineffaceably algebraic principles or scientific truths, the attention must command all the individual ideas in such a way that they are apprehended and comprehended, until every relation is established. To accomplish this, each new fact must be scrutinized and made to fit into the system necessitated by all the kindred facts. This *relating activity* is the higher form of attention and insures more valuable associations.

When there is an attempt to make artificial associations in a mechanical way, as in learning foreign languages, the names and locations of various geographical features, or a series of historical data, there is often no interest in the process, and the results either become confused or soon disappear. Experiences do not become deep and permanent without undivided attention. Genuine attention is only possible when there is a full headway of interest.

Frequently insufficient time is given to make associations permanent. A flash-light may disclose an interesting scene, but before the mind has had time to dwell upon its contents it is passed by for another one. The succession of views becomes confused. Similarly with the multiplicity of things which often engage the school child's attention. He flits from study to study and from topic to topic so rapidly that no idea has a chance to be recalled or contemplated. When we consider the number of topics that a child is frequently

expected to learn in history or geography in a year, the surprise is not that he forgets some but that he retains so many.

Repetition of what has been learned is an important factor, especially in mechanical memory. The association tracks are to be deepened, and the oftener the ideas are recalled in the same order the better the retention. Here again the psychology of advertising has abundant suggestion. No one can help knowing the particular merits of Ivory Soap, Pears' Soap, Rubifoam, Peruna, Walter Baker's Cocoa, Swift's Premium Hams, or Force. They have been inescapable. We encounter their compelling pictures and persuasive phrases in every newspaper and magazine. We cannot turn a street corner or glance out of a car-window or even withdraw our glance to the car interiors without encountering some of these ads. In season and out of season, whether we will or no, we are bound to meet them.

The teacher may well take a hint. Some of the arts most worth striving for can be taught by the same process. Take language, for example. In no other way can the child ever develop correct speech except by hearing it, seeing it, and feeling its power during every minute of the school-day, and properly in the home. The child who hears correct speech only in the language class will never acquire it. Morals and manners must be taught in the same fashion. If good examples are only advertised on Sunday, the intervening week-days will obliterate all traces.

The Observance of Natural Relations is always an excellent means of fixing associations. This is true because when once the relations are observed the coexistent factors are frequently brought before consciousness. Such phenomena as thunder and lightning, warm weather and growing vegetation, cooling atmosphere and condensation of moisture, change of temperature with change of thermometric reading, being casually related, become easily impressed upon the mind when once the relationship is observed.

However, the fact that relationships exist between objec-

tive things is no guarantee of their being observed and recorded together. For example, the relation between forests and rainfall has only recently been observed; the circulation of the blood is a new discovery; the bacterial theory of disease not a half-century old. A pupil would be a long time discovering the relations between varieties of soils and adaptable crops, though when once understood they become indissolubly connected. Just so with multitudes of facts in geography, science, and history.

The import of this is to emphasize the necessity of forming systematic, logical, and causal relations among series of facts rather than to depend upon artificial associations. The natural relations are more apt to be forced upon the mind repeatedly. Too much of geography teaching and history teaching is made to depend upon absolutely mechanical associations, when everything could be presented in a connected series of thoughtful relations. There are some things desirable to learn which must be largely isolated, but the majority of all knowledge, whether in school or out of it, can be so grouped as to become woven into logical relations. People's names have no logical relation to their possessors, but when we come to know the individual thoroughly, his habits, his temperament, his home, his associates, and his capacity, the name becomes so complexly associated with the individual that a multitude of suggesting strings may be pulled, any one of which will recall the right name. The case is far different with the child in learning the list of capes on the coast of America, or the boundaries of each of the states. In these cases there is only one sort of association, and that purely artificial and mechanical. When the child learns rules in arithmetic or grammar without comprehending them, the associations are purely arbitrary and mechanical. When we shall have become entirely free from such atrocities committed in the name of education, a day of rejoicing may be proclaimed.

Recognition of Varieties of Memory Functions.—The fact that different individuals have different types of memory suggests the desirability of recognizing these individual charac-

teristics in memory training. These should be considered in two ways. First, the one with a special gift in any direction should know how to utilize it; and, second, the one who is specially defective in any direction should be helped to remedy the defect, if possible. Use as many senses as possible in acquiring ideas. We should remember that knowledge is very complex, and that a variety of experiences enter into the real and complete knowledge of every concept we possess. For example, the complete knowledge of that classical fruit, the orange, includes taste ideas, those of smell, touch, weight, color. In the case of this particular fruit, most of us have received the actual primary experiences. But in how many cases are we satisfied with getting only a single set of sensations, and then expect that all the other factors will be represented through the fiat currency of words that we employ! The druggist who did not employ several senses in acquiring his knowledge of drugs would be a dangerous person to compound medicine for us. The successful one relies not on sight alone, but upon the touch, the odor, the consistency, the weight and sound. Chemistry used to be taught from a book by learning names, symbols, and formulas, without ever seeing a compound. By such teaching a pupil could not tell sulphuric acid from kerosene, or quartz from meerschaum.

Spelling is a process in which sight, hearing, the muscular movements of the arm and the fingers, muscular movements of the vocal cords, the tactile sensation in the hand, joints, and vocal cords, all may and should enter. Unfortunately, unpsychological faddists successively accentuate some one or other of these factors to the neglect of all others. Each faddist is partly in the right, but all are in the wrong. Ideal results cannot be secured in this useful art until the ear is trained to hear the syllables and other component elements, to hear the exact pronunciation as a whole, and the succession of sounds in uttering the letters and syllables; until the eye is trained to see the word as a whole, and in various analyses; until the muscles of the vocal apparatus are habituated to the utterance of the various combinations; until the hand

and arm have formed definite and ready associations of movements; and, finally, not until there is a perfect harmony and co-ordination among all the various processes. Then only can the spelling of any combination be said to be properly mastered.

Note should also be made of the fact that impressions are not received through a given sense equally well at all times. For example, the ear is used to interpret language symbols several years before the eye. In racial development the ear was for ages the only interpreter of language symbols. This should be recognized in teaching. Early education should be almost wholly oral. The child's language expression should be vocal; instead, he is often plunged into reading as a means of learning, and the hand is set to pen-wagging as a means of expression. Halleck tells us (*Education of the Central Nervous System*, pp. 48–54) of a class that had struggled hard and long to interpret visually "As You Like It." But they failed utterly to grasp it. It was finally read to them and the change was marvellous. No greater pedagogical heresy is perpetuated at the present time than the atrocious method of instructing little children in singing by note. Instead of giving them an opportunity to hear sweet melodies and then encouraging them, through imitation, to burst forth into songs of praise and gladness, they are required to read a strange, meaningless Chinese puzzle. The little singing they learn, which is indeed a diminutive quantity, is really gained through imitation of what they hear.

Interest and Memory.—Joseph Cook is said to have written in effect: "Interest is the mother of attention, and attention is the mother of memory; if you would secure memory, you must first catch the mother and the grandmother." The boy who has no interest in what he does, but goes through his tasks in a purely perfunctory way, does not acquire much, and retains that little poorly. The boy who blunders in his arithmetic, forgets how to spell, and seems to be unable to remember his geography may be, and probably is, one who can remember every detail of all the season's football games.

He can name every player who took part in each, remember all the "star plays," the fouls, the bad decisions of the umpire, the different formations that were tried; in fact, like the politician, his fund of knowledge of certain sorts seem inexhaustible.

I once had a boy in school who was called a dunce by many of his teachers, but who knew more about birds than all his teachers combined. Strangely enough, too, most of his teachers had never discovered this interest. A little judicious consideration of this boy's interests which he brought with him furnished a key which unlocked other interests. He did splendid work in nature study, his arithmetic work became the strongest in his class, and, in fact, his work in all lines was second to no other's. The only thing he had needed was an enlistment of his interest. By interesting myself in things that appealed to him, I was able to direct his attention to other things which I thought he should know. The child who is kept after school to do work as a penalty remembers well enough his emotions on the occasion, but forgets speedily the lesson imposed. The mind must be in the right attitude, and be a willing party to the operation. The mind that is not aglow with enthusiasm for the task in hand continually wanders away to more alluring fields, attention is scattered, and mental acquisitions are vague, confused, and fleeting. Irksomeness and superficiality of acquisition are natural accompaniments.

Clearness of Ideas.—To record ideas so that they may be permanent, and also that they may be recalled readily, it is necessary to comprehend them clearly. The majority of ideas which come to our minds are so vague and poorly defined that they make little impression and are soon lost. It is a common fault of teachers to lack lucidity in explanation, and text-books are generally very abstract. Limited space, to a certain degree, necessitates this abstractness of text-books, but it is the teacher's business to be concrete and clear himself, and to render condensed abstractions of the text-books clear and comprehensive, when necessary, by copious illustra-

tions. In the lower grades most text-books should serve as summaries of material secured from real presentation by the teacher and from concrete collateral material gathered from necessary books, experiments, and excursions.

Comprehension vs. Apprehension.—The foregoing consideration of memory should teach us much with reference to modes of attempting to secure lasting impressions of various schoolroom lessons. According to the character of the material, some should be memorized mechanically, while in other lessons no attempt should be made to secure automatic reproduction of fixed forms. In lessons where content is to be memorized, the efforts of the learner should be centred upon mastering the ideas contained. The attempt should be to understand, to know, and to let memory take care of itself. That which is apprehended in perception, comprehended through apperception, and woven into the warp and woof of mind through manifold associations will be retained without recourse to artificial memories. McLellan says (McLellan and Dewey, *Applied Psychology*, p. 95):

> Do not aim at training memory directly, but indirectly, through the training of the apperceiving powers. The attitude of the pupil's mind should be: I must *perceive* this just as it is and in all its bearings; not, I must *remember* this. If the original perception, in other words, is what it should be, accurate, comprehensive, and independent, memory may be left very largely to take care of itself. For the first step in remembering anything is to get it within the mind, and apperception is just this getting it within the mind.

A careful consideration of the lessons to be taught, for the purpose of determining just what is to be acquired, and how it is to be acquired, is of prime moment in the teacher's daily plans. Whether a given page is merely a scaffolding which should form a setting for the real structure, or whether it is a part of the structure itself, should be clearly distinguished. Oftentimes many paragraphs must be included merely for the sake of a proper background for the picture which is to be discovered. They are necessary to complete understanding, but there is no necessity for centring the attention upon

them. But the salient facts, principles, and laws should be focalized, crossed and recrossed, viewed telescopically, microscopically, with the physical eye, and through the eye of imagination. Finally, through the highest processes of abstraction and symbolization, the concepts should be comprehended in all their fulness without recourse to the elementary means necessary to the first fundamental ideas.

Modes of Recall.—The function of recall in the learning process is of great pedagogical interest. The recitation has for one function the recall of ideas for the purpose of fixing them in memory more firmly. Under what conditions should recall take place so as to make learning the most sure and economical? Ebbinghaus (*Ueber das Gedächtnis*, Leipsic, 1885) studied the matter experimentally, in connection with learning nonsense syllables. He found that if the list contained several syllables one reading would suffice, when the list contained twelve syllables it took sixteen repetitions. Sixteen syllables required thirty repetitions. This suggested the desirability of short lessons, especially with children. After a lapse of twenty minutes he found that 58 per cent as much work was required to recommit as to commit a new list. After an hour the further loss by forgetting was small. Colvin says, however, that in the case of thought processes, as opposed to forms of expression, when once the idea is learned, recall twenty-four hours after learning is as accurate as immediate recall. This suggests the importance of frequent drills upon things that are to be learned verbatim, but the lack of such necessity when dealing with ideas. For example, the spelling lesson and elementary foreign languages require frequent repetition, while the history and nature-study lessons should be dealt with as ideas, and will not require much or frequent repetition in learning. The Germans recognize these principles in a practical way in the organization of their school curricula. Latin and other foreign languages are given every day, and sometimes twice a day in the initial stages, while history, geography, and nature study are given about twice a week.

Kind of Memory to Employ in a Given Case.—It is also important to know whether the form of expression in a given lesson should be learned exactly. There are some things that should be learned exactly, that should be learned verbatim. In these the form as well as the content is important; in fact, in some cases, without the exact form the content would be largely valueless. Among the things which should be firmly fixed in the mechanical memory are the following: The addition, subtraction, multiplication, and division tables; certain tables in denominate numbers; a rich vocabulary of words in the mother tongue; vocabularies in foreign languages; the spelling of all of one's usable words in the vernacular; some mathematical formulas that are constantly applied in higher mathematics; paradigms in ancient languages or other foreign languages, read only; many gems of literature; occasional definitions; principles and laws.

Except in the case of spelling, tables of the fundamental operations in arithmetic, and certain parts of vocabulary learning, the processes need not be devoid of thoughtful associations. The multiplication table and much English spelling are, however, as mechanical and content-less as "ickery-irey, ooery-ann"—and must be learned by point-blank mechanical associations. In such cases repetition is about the only way to establish the mechanical bonds of association. In other cases admitting of analysis and thoughtful consideration, the content should be thoroughly mastered before attempting to impress the form of expression on the mind. This should be the invariable rule, for children easily focus upon learning the expression before comprehending its significance. The meaning of all generalizations to be memorized should be taught indirectly, thus coming to the concentrated statement last. Joshua Fitch expressed the matter in a paragraph almost worthy of being memorized verbatim by every teacher. He wrote:

> When the object is to have thoughts, facts, reasonings reproduced, seek to have them reproduced in the pupil's words. Do not set the faculty of mere verbal memory to work. But when the words them-

selves in which a fact is embodied have some special fitness or beauty of their own, when they represent some scientific datum or central truth, which could not otherwise be so well expressed, then see that the form as well as the expression is learned by heart.

Analyze Material.—In trying to remember or in teaching pupils to remember, one of the first things to do is to analyze the material to determine its character and the purpose in learning. Each type of material must be learned in a different fashion. Oftentimes pupils are assigned a lesson, and, believing that they will be required to recite the text verbatim, they try to memorize it in a mechanical way. Without trying to comprehend it, they repeat it over and over again. The words thus learned are soon forgotten, and with the result that they have neither the words nor the ideas.

After comprehension of the meaning some tables of denominate numbers, definitions in arithmetic, grammar, geometry, algebra should be thoroughly memorized. The statement of theorems in geometry as given in the text-books can hardly be improved upon and should be memorized verbatim *after understanding* their meaning. The demonstrations should *never* be memorized. Whenever the object is to acquire some fact, law, principle, or process that must be used continually in the same way, the form as well as the substance should be learned. It is also an excellent plan to have pupils learn verbatim many proverbs, short poems, and worthy artistic prose expressions which epitomize wise sayings of the great thinkers of all time. Such expressions grow in significance as the years go by and become richer and richer in meaning. Most children can acquire much in this way without difficulty.

On the other hand, most of the knowledge acquired in everyday life need not become a part of habitual action. It is to become a part of the background of consciousness and the exact record is unimportant. We need simply to apprehend it, but not to fashion it into forms of conduct.

Selective Memory.—The obvious suggestion which grows out of the foregoing analysis is that in economical learning, instead of trying to memorize details we should select the sig-

nificant factors and large concepts and try to fix these in mind and discard the mass of details which has merely served as a scaffolding in building the real structure. After thoroughly mastering that which is to be learned, then try to recall the large concepts and ideas. Do not bother with the details. If the details were once mastered and incorporated in the large ideas, there will be no difficulty in filling in details if necessary. Be sure, however, that you really have the ideas and not merely some catch words and phrases that stand for the ideas.

Before starting to read a chapter or topic it is well to try to determine before opening the book what subtopics and points are discussed. Try also to think how you would treat the topic. Then open the book, glance through the topic as a whole to see how the author has organized it. After that read each paragraph or section carefully, stopping at the end to see if you comprehend. Difficult points must be dwelt upon and studied intensively. Go through the entire chapter in that way. Then put the book aside and see if you can state the topics treated. Often it is well to actually write an outline statement of the main points. Then concentrate upon each one and see if you are thoroughly convinced that you understand the points completely. Some points need not be dwelt upon long, because you have a consciousness that you fully comprehend them, that they are very similar to some previously learned points, or that they are relatively unimportant ones. Should you come to a topic that seems hazy, entirely obscure, or one that should be fixed firmly, centre upon that one. Generally there are only a few such points in a given lesson. Much of the material is for the purpose of leading up to the main principle or to give a general setting, or it reviews much that has gone before.

Importance of the Recitation.—Ordinarily the recitation is thought of as a means of giving the teacher an opportunity to find out how faithfully and well the pupil has prepared the assigned lesson—a chance to square accounts. There is something to that from the moral side, but that is not the main

purpose of reciting. The main value is (*a*) because it gives opportunity for expression, and (*b*) because it reveals to the learner his own lacks. A noted lecturer once said: "I lecture not to enlighten others, but to clear up my own ideas."

The recitation reveals what has been learned and what has not been learned. Socrates considered that the first step in gaining wisdom was a recognition of one's own ignorance. "From impression to expression" is one of the most valuable maxims of modern psychology. The expression tends to clear up and fix ideas.

Again, one's attitude in studying is wonderfully modified by the consciousness that what is being studied will be called for. If one were absolutely certain that he were to be called upon to repeat every fact acquired, the results would be vastly different from what they would be if one were absolutely sure of not being called upon to recite. Students should form the habit of reciting to others what they have gone over before going to class. They should also frequently write out abstracts and try to form concise generalizations of topics read or heard discussed.

Be severe with yourself. Do not be content with laziness or half mastery. Difficulties slid over will surely be encountered as stumbling-blocks later on. Ask yourself questions about the meaning and the relations to other materials previously studied. Try to think what questions the teacher might ask and be sure to answer the questions satisfactorily to yourself. Be mercilessly critical with yourself. It is far better for you to discover faulty learning in yourself than it is to have it discovered and recorded by the teacher. Many a pupil might have passed a good examination instead of one full of flaws, inaccuracies, and omissions if he had only stuck to the lesson until he had mastered it.

After going over the lesson as suggested, try to express a part or all of it to some one else. Explain it to your roommate and let him probe with critical questions. Be as definite and as accurate as possible, even to details. Keep in mind the probability all the time that some one will ask you

to express the knowledge acquired. If you have a subconsciousness that you are absolutely certain to be called upon to recite, you learn in a far more thorough manner than if you feel pretty certain that your turn will not come that day. The one who figures on escaping recitation is storing away vague ideas which are very elusive about examination time.

Regular Study Schedule.—In school organization we have properly given much attention to securing definite recitation periods. But little has been done to provide definite and regular study periods. If pupils would only form regular, adequate habits of study, and learn how to study, the recitation would be largely unnecessary, or at any rate it could be utilized in a far different manner from that which is usually necessary. A definite study programme should be arranged and adhered to. Only the most exceptional circumstances should be allowed to interfere. The very habit of taking up a given task at the scheduled hour is one that is exceedingly valuable. A habit of procrastination begets slothfulness. Too many persons have revised the old adage to read: "Do not do to-day what can be put off until to-morrow." The regular study schedule should apply to school work done at home as well as that done at school.

Supervised and Directed Study.—Much energy in study is often dissipated because pupils do not know what is to be learned—they do not know what to concentrate upon. Clearness and definiteness in assigning lessons, a due consideration of the apperceptive data already possessed, and proper conditions for study would do more for the recitations than any patent methods of questioning or conducting recitations. Pupils need to be taught how to study in order to accomplish it economically and efficiently. Many of our best educators are coming to insist upon due attention to the proper assignment of work. A considerable part of many recitation periods should be devoted to planning methods of attacking the new problems. Too many teachers regard the class period as a time for pumping the pupil in order to square accounts. Not infrequently they pump from a very dry well. Extreme mis-

interpretation of the Socratic method of questioning has led teachers to believe that they must not instruct or teach, but merely question and record. Their greatest function is to teach and to guide in methods of acquisition. Dutton says:

> Supervise the study periods. The teacher who asks his pupils to study, and then proceeds to write letters or make up his reports, is not only losing an opportunity but is violating his trust. He should be at the service of his pupils, passing around from one to the other, giving the needed word of advice or encouragement, making sure that all the conditions for earnest work are as favorable as possible. (*School Management*, p. 171.)

Pupils need time to think. A high-school pupil once said: "All our time is so taken up with learning our lessons and reciting that we have no time to think." Alas! this indictment is too often true. In the hurry of activities, in school and out, with the methods employed, when do the pupils really find time to reflect upon what they are doing? There should be frequent times in the pursuit of every subject when the learner may have time for meditation, sustained reflection, and opportunity for independent organization of the work in his own mind.

I have found it very helpful in advanced classes to assign written reviews to be worked out at home. Some help is usually necessary in organization, but only the main features are suggested and the students are left to give expression to the ideas as they lie in their own minds. This plan necessitates the using of class notes, gathering of materials from collateral reading, and organizing the whole topic for themselves. The topics given out for written organization frequently should not be wholly or definitely covered in the books or in the discussions, but should consider some new relations growing out of the materials at hand. Sometimes a topic may be studied intensively for a time and then written up during the class period. Such work is the best sort of examination, and has the great advantage of giving opportunity for deliberately organized thoughts and the formation of multiple associa-

tions. A necessary prerequisite of all memory of real ideas is just this associative reflection.

Multiple Associations.—Many diverse associations are necessary to secure the best memory. The more numerous and diverse the associations connected with a given fact, the more possibilities of its recall. Each experience becomes a "suggesting string" which may be pulled to induce recall. There is great danger that associations will be too few and of the purely mechanical type. The way in which the ordinary text-book history is studied illustrates the point. The number of topics is large, because the historian feels compelled to give a complete account. This necessitates great brevity of topics, usually at the expense of clearness. Furthermore, this condensed compendium frequently necessitates giving as much space to comparatively unimportant events as to those which are of vital significance and which should be expanded according to their importance. An actual count shows that average school histories contain about 1,500 topics, any one of which would furnish several days' lessons if studied sufficiently to be clearly comprehended. The entire 1,500, however, are frequently forced kaleidoscopically before the children in about 270 lessons. What wonder that the whole subject is but a confused blur in the minds of the learners? If a few leading topics were selected and then studied deliberately from many sides until thoroughly comprehended, the resulting product would be infinitely more valuable. With the abundance of collateral material easily obtainable, every lesson ought to be illuminated by the teacher, and by means of other readings, until the pupils see the actors face to face, instead of through a glass darkly. What boots it if the entire book is not covered? Not all history is recorded in one book, and no single author has selected the only events worth while.

The important thing is to have the pupils know how to study the subject; to know where to find books and sources that are worth while; and to understand some history so well that it will modify their likes and dislikes, and bias their entire future thinking. Through this they should develop a taste

for history and a knowledge of its proper methods of study. If they have not acquired a genuine interest in the narrative of history, the work has been largely unfruitful. If a high-school pupil should spend an hour a day for three weeks reading on the Missouri Compromise or the United States Bank, he would have some ideas so clearly and firmly implanted that he could talk intelligently upon the subject, and, moreover, he would never forget the salient features. The ideas gained would be so many-sided and the associations so diverse and multiple that they could not be easily forgotten. How different is much of the study of history!

In studying geography it is not necessary that every fact chronicled in a text-book should be learned. The text is usually a compendium for reference. There is no reason why a pupil should take all of the topics, and in precisely the same order as given in the book. Suppose the order is varied and some topics even omitted? If the topics taken are rendered interesting and clear and full, the method of geographical study will have been impressed and the facts learned will be usable. In order to accomplish these fundamental ends, only a few things can be studied, and these must be taken so exhaustively that no doubt exists as to whether the resulting knowledge consists of words alone or of clear, well-defined concepts gained through concrete individual notions. Usually the book contains only the merest statement of the concept. All concrete details, which are absolutely necessary prerequisites to conceptual ideas, are lacking. Hence the child begins with the generalization which should be the end. The elementary text-book is a good summary, but not an exhaustive treatment of any of the topics discussed. Much of the material for the adequate treatment must be supplied from other sources—by the teacher and collateral books.

We marvel at the politician and the scholar who seem to have an inexhaustible fund of illustrations and arguments bubbling over for expression. We say "What wonderful memories!" But outside of their specialties the memories would probably be found as unresourceful as other people's.

The secret of their fund of ready recall is easily accounted for by the long study and reflection upon the same thing. Whoever has the perseverance and gives long-continued attention to any line of investigation can acquire a fund of ready knowledge sufficient to enable him to talk authoritatively upon that line.

Teachers are frequently disappointed in examinations because pupils seem to have forgotten so much that they had supposedly been taught. The wonder is, however, not that pupils have forgotten so much, but that they remember as much as they do. The main reason why they do not remember more is that they have not really learned anything that they were asked to recall. They may have read the words of the lessons assigned and the teachers may have explained, but, unless the lessons have become more than words, retention of ideas cannot follow.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Have you recently read of any sure means of acquiring a "steel-trap" memory? 2. Were there any sound psychological principles underlying them? 3. Do you know of any phenomenal memories? 4. Do you know of any peculiar memories? 5. Is your memory equally good in all directions? 6. Do you learn certain subjects more easily than others? 7. Do you recognize any differences between your present memory ability and your childhood ability in memory? 8. Try memorizing some simple prose or poetry. Have some children of 8 or 10 try the same. Compare results. 9. Try the whole and part methods with different types of materials. Note results. 10. What principles apply in learning the ideas in this book? 11. Criticise cramming for examinations.

References for Further Reading

1. Bolton, *Principles of Education*, chaps. XIII, XIV, XV.
2. Cameron, *Psychology and the School*, chaps. VI, XII.
3. Colvin, *The Learning Process*, chaps. IX, X, XI, XII, XIII.
4. Colvin and Bagley, *Human Behavior*, chap. XV.
5. James, *Talks to Teachers on Psychology and Life's Ideals*, chap. XII.
6. Parker, *Methods of Teaching*, chap. VIII.
7. Pyle, *The Science of Human Nature*, chap. VII.
8. Starch, *Educational Psychology*, chap. XI.
9. Thorndike, *Principles of Teaching*, chap. VIII.
10. Woodworth, *Psychology: A Study of Mental Life*, chaps. XIII, XIV.
11. James, *Principles of Psychology*, vol. I, chap. XVI.

CHAPTER XIII

LEARNING THROUGH IMITATION

Recent Recognition of Its Importance.—Men have long recognized that imitation influences the conduct of individuals and of groups. However, it has usually been thought to be a low order of learning, something characteristic of the immature, something slavish and uncommendable.

It is only recently that we have come to understand that imitation is one of the most fundamental and important means of learning. Only the imitative individual is capable of learning, and the most imitative is the most educable. Even animal trainers recognize this. If they find an animal that imitates poorly, they try to secure one more apt.

Meaning of Imitation.—Whenever an action has been performed, an organic memory is left. Because of this modification, there is a tendency to repeat the same action, even though there is no outside stimulus present. If the stimulus recurs, the reaction takes place easily, reflexly, almost automatically. *This tendency of an organism to repeat an action once performed is imitation.* The essential process is the copying of one's own action and not the action of some one else.

It is thus seen that all imitation is of the reflex type, and fundamentally all imitation is autoimitation. One can imitate only those actions which he himself has experienced. In copying others one selects those factors which have been experienced and sometimes recombines them so that they seem to be new and novel. A good illustration of autoimitation is afforded by the process of acquiring speech. It is an interesting and significant fact that the first words of all children of all nations or tongues are *papa*, *mama*, *daddy*, or some modification of them. That occurs not because the children try to use words meaning father and mother. Before they use vocalized speech

their natural vocalized sounds are *ăh*, *äh*, *eh*, etc. When the nascent period for vocalized speech appears they begin to use the lips and tongue, and consonant sounds precede the vowels. The expressions then become mä, mä; bä, bä; dă, dă, etc., and the fond parents say: "Why, the baby is saying papa and mama!" The babe had no such thought. The child was just reflexly uttering the only sounds possible. It is more correct to say that the parents imitate the children. When the child hits upon these new expressions, it is so pleased with the acquisition that it oftentimes keeps up the babbling for minutes at a time. Hence, this is sometimes called the *lä lä* period of language.

Imitation Not Always Voluntary.—Imitation has generally been considered to be a conscious, intentional copying of others. But we know that everybody, little children especially, imitate many acts of others without every intending to or even being conscious that they had observed them. Our pronunciation of words is taken on unconsciously, our mode of standing, walking, and various mannerisms could not be traced to any particular attempt to copy some one else, but we have "caught" them somewhere unintentionally. If one child afflicted with St. Vitus's dance goes to school with normal children, the chances are that others will soon become afflicted. If a teacher talks in a harsh, high-pitched tone, before long all her pupils will be doing likewise. A gentle, well-modulated voice on the part of the teacher is equally contagious. A nervous, fidgety teacher is sure to infect all her pupils, while one that is calm and well-poised will exert a wholesome influence on all around her. All that is summed up in the expression "unconscious education" is a matter of non-voluntary imitation.

Ideomotor Action.—Recent investigations have demonstrated that all ideas tend to express themselves in action. Whenever any idea is held by the mind, it struggles for muscular expression. Suppose you awaken some cold morning and say to yourself "I must get up," but try to banish the thought and attempt to take another nap. You continually

find yourself thinking "I must get up," "I must get up," but finally apparently banish the thought. All at once, when enjoying a cat-nap or a day-dream, without thinking, up you get. The thought has worked itself out into action. Any one can easily walk a two-inch board on the floor. But suppose the board is placed a hundred feet above the floor. No one but an acrobat or a trained gymnast could accomplish the feat without falling. Why the difference? In the latter case the thought of falling so possesses the mind as to inhibit everything else, and naturally enough the motor response speedily follows up by destroying equilibrium and causing the fall.

The ideomotor action is not imitation, but it furnishes the starting-point of multitudes of imitative reactions. It provides the pattern which tends to be copied. This is of great importance, because the individual is thus seen to be very greatly under the influence of environment which furnishes the stimulations.

General Illustrations of Imitation.—Language has an instinctive basis, but its particular form is wholly due to imitation. That we speak and gesture rather than howl, bark, or neigh is a matter of instinct; that we speak English, French, or German rather than Russian, Armenian, or Choctaw is due to imitation. The English boy drops his h's where we should put them on, or tacks them on where we should suppress them, simply because he lives with others who do so. The New Englander says nevah, rivah, and Jarvar; the Englishman says dŏg, while the Western American says dawg; the Englishman calls a young bovine a cälf, while the ranchman maintains that it is a călf. In one region of the United States every one says bucket; in another, pail. I carry a pocketbook, the New Englander a wallet. The city man goes to church, his country cousin goes to meeting. I attended a Sabbath-school when a boy, my children go to Sunday-school. Whether one whistles a *tune*, a *tyune*, or a *tschune*, all depends upon who his neighbors are. Slang phrases, catchy expressions, or popular songs are caught up by the special circle to which they appeal; they

are dinned into everybody's ears, and finally resound from the lips of all who have been made listeners, willing or unwilling. How many of us have felt chagrined on catching ourselves humming some meaningless nickeldom melody, or using the latest slang expressions?

Manners and customs are products of imitation. Thousands of our everyday matters of etiquette no longer have any reason back of their performance. Though they may have originated in some rational way that has long since disappeared, they are now perpetuated solely through imitation. For example, the people of many nations shake one another's hands on meeting; but those from some countries shake their own hands. Americans and Englishmen say "How do you do?" the German, "How goes it?" American men lift their hats to a lady; the German is more apt to do so on meeting a man. With Caucasians, black is an emblem of mourning; among the Chinese, white performs the same service.

Fashions in dress are created and perpetuated through imitation. Were it not so, scores of hideous, unbecoming, unhygienic fashions could never have been launched. Desirable fashions are maintained in the same manner. There must be leaders who will be aped in all they do to set the ball rolling. Their devotees pay homage by immediate adoption. Metropolitan milliners, dressmakers, and tailors know that to insure changes of fashion all they need to do is to induce some leader to appear in a new style, and the fashion is launched. This is a usual method of stimulating trade. Psychical laws are the most potent factors in economics. A history of furniture reveals characteristic styles prevailing often for centuries. But within the memory of every adult the styles in furniture have changed at least three distinct times. In dress, at least half a dozen special epochs may be traced through the last quarter-century, besides a semiannual upheaval in minor matters. One should enjoy his Flemish oak and his mission patterns as fully as possible to-day, for to-morrow they will be sought out by relic-hunters. The sixteenth-century style was reopened to the sunlight for a day at the close of the nineteenth century,

and shut away for another cycle to proclaim it the only style worth possessing.

Dramatic Imitation.—One of the important elements of dramatic representation is the imitative. Through suggestion an idea is received and its representation is carried out with more or less fidelity. In children the impersonated self often becomes so real as temporarily to supplant the usual self. James writes (*Principles of Psychology*, II, p. 409):

> For a few months in one of my children's third year, he literally hardly ever appeared in his own person. It was always "Play I'm So-and-So, and you are So-and-So, and the chair is such a thing, and then we'll do this or that." If you called him by his name, H., you invariably got the reply, "I'm not H., I'm a hyena, or a horse-car," or whatever the feigned object might be. He outwore the impulse after a time; but while it lasted, it had every appearance of being the automatic result of ideas, often suggested by perceptions, working out irresistible motor effects.

Sully tells us that children, when pretending to live another life, frequently resent any intrusion that seems to contradict the harmony of the simulated world. He relates that "a little girl of 4 was playing 'shop' with her younger sister. 'The elder one' (writes the mother) 'was shopman at the time I came into her room and kissed her. She broke out into piteous sobs. I could not understand why. At last she sobbed out: "Mother, you never kiss the man in the shop." I had with my kiss quite spoilt her illusion.'"

Following the Crowd.—The world is full of everyday illustrations of following the crowd. Commercial panics are good examples of the force of wholesale imitation. Let it be rumored that there is a run on the bank. If a neighbor is known to have withdrawn deposits, a dozen will follow his example, and immediately a stampede is precipitated. At a fire one giddy, emotional individual can cause the multitude to indulge in a mad, frenzied rush, while a calm, phlegmatic temperament assuming generalship can quiet the turbulence and lead the unstable throng to safety. Because of suggestibility and imitation we have such phenomena as the Crusades,

witchcraft, the Dutch tulip craze, and the Mississippi Bubble.

Imitation is rife in politics. The majority of men vote the party ticket of their fathers. Few come to fixed, independent beliefs through reflection and deliberation. Men often believe themselves original thinkers, but even college-bred men vote largely as their fathers did. Deahl made an investigation which, though in a somewhat limited field, confirms casual observations. He found that out of fifty men selected from among college graduates, and many of them college professors, 84 per cent voted the same ticket as their fathers voted. Could a promiscuous canvass of the less well educated be secured, the percentage would probably be even larger.

Imitation in the Fine Arts.—Although the products of the fine arts are not mere copies, they are, nevertheless, imitative. Sir Joshua Reynolds says: "Our art is not a divine gift, neither is it a mechanical trade." Even though an artist does not copy other works of art, he must go to nature for her innumerable forms. Goethe writes: "The artist must hold to nature, imitate her. He must choose the best out of the good before him." Art has gradually developed by slowly accumulating imitative accretions. Visit the famous art galleries and study the art of schools or periods. To the novice the sameness in a given school or period is more striking than the differences. The individual variations which the connoisseur recognizes as originality and marks of genius are very real and very great to the critical eye, but they are apt to be overlooked by the multitude.

Deahl writes:

> The fundamental principle in any school of art or of literature is imitation. Among the master artists it is selective, intelligent, often unconscious imitation. Among the second or third rate artists imitation is the cause of similarity, but is a less-intelligent, a more-mechanical kind of imitation; it approaches nearer to what we term copying. (*Imitation in Education*, p. 31.)

Before the artist exhibits great originality he must spend years in imitating—either nature or the products of other art-

ists. This in no wise implies mere copying. It means that the great works should be studied, the principles mastered, the ideas absorbed, and new inspiration developed out of them. It is said that William M. Hunt, one of America's eminent artists, advised continued study of the best works of art. "You must set yourself ahead by studying fine things. I've told you over and over again whose works to draw—Michael Angelo, Raphael, Dürer, Holbein, Mantegna. Get hold of something of theirs. Hang it up in your room, trace it, copy it, draw it from memory over and over, until you own it as your own 'Casabianca' and 'Mary had a Little Lamb.'" (Quoted by Deahl, *op. cit.*, p. 29.)

Imitation in Literature.—Although imitations are not so easily traceable in literary productions, yet a critical study of many of the masterpieces will disclose the effects of suggestion, at least. Longfellow's "Hiawatha," as is well known, has a prototype in the Finnish poem "Kalevala." Longfellow cannot be said to have copied it from "Kalevala," but he received very definite suggestions as to both form and content. Chaucer was doubtless much indebted to Boccaccio for suggestions which were utilized in *The Canterbury Tales*. Most of Shakespeare's plots were not absolutely original with him. Carlyle's *Sartor Resartus* is plainly of German origin. Rabelais, while imitating the Greeks, afforded suggestions for many who followed him. Many incidents similar to those in *Don Quixote*, *Robinson Crusoe*, and *Gulliver's Travels* under other names and bearing the imprint of other pens, are said to have delighted many, even centuries ago. To assert these facts is in no wise to discredit the authors. To be able to imitate and give in addition the creative touch of a new whole is evidence of genius. The majority either copy blindly and poorly without deviation or advance, or they do not see what is worth while to imitate. Without making use of what has been wrought and giving it a new turn, the world would remain at a standstill. To imitate is no sign of weakness. "When a writer improves what he imitates, he does well; but when he fails to add beauty, we condemn him. New light, or grace, or charm

must be given. In the progress of the mind, in all departments of literature, we find imitation, the most palpable in the books we most admire." (Deahl, *op. cit.*, p. 33.)

Educational Value of Imitation.—Every teacher ought to understand the great importance of imitation. Up to the time the child has entered school a very large proportion of its knowledge has been gained and retained in a purely imitative way. If pupils imitate, the great educational question is how to select wisely copy that is worthy of imitation. Several of the ancient writers on education realized the importance of imitation in education. Plato shows its value in learning language, music, painting, science, dancing, literary style, and also in formation of character. Xenophon believed that the most effective way of teaching behavior and manners is through imitation. Aristotle cautions against leaving children much with slaves, and also urges us to be careful what stories children hear. Many Greeks are known to have been solicitous that their children should mingle with those who spoke pure Greek. Plutarch urged in his essay on *The Training of Children* that they should be shielded "lest, being constantly used to converse with persons of barbarous language and all evil manners, they receive corrupt tinctures from them. For it is a true proverb, 'that if you live with a lame man you will learn to halt.'" Quintilian would insist that the nurse have a good moral character and that she should "also speak with propriety. Let the child not be accustomed, therefore, even while he is yet an infant, to phraseology which must be unlearned."

Imitation in Language Education.—Think what it means to learn to talk! A grown person would give a great deal to learn to speak a foreign language correctly in a few years. The child at 5 or 6 years has gained almost perfect command of the oral expression of all his thoughts. Of course his ideas and his vocabulary are limited, but his expression is almost perfect within his limited range. At this age the number of words is not so small, either, as one might suppose. An average child of 6 years brought up in a good home pos-

sesses a usable vocabulary of a couple thousand words. He understands nearly double that many. An adult often spends years of painfully conscious labor in acquiring the vocabulary of a foreign language. Not only does imitation determine whether the child is to speak English, German, French, Icelandic, Choctaw, or Siamese, but the vocabulary, the inflection, to some extent tone, rapidity, order of words, choice of illustrations, are also matters of imitation.

It is easy to recognize the rôle played by imitation in the first years of childish attempts to master the mother tongue. Children learn through imitation to clip their words, to intone them clearly, to talk in monosyllables, or to drawl. The boy when asked why he drawled his words replied: "Mother drawls her'n." The deaf child, unable to imitate the speech of his fellows, remains mute (unless he learns lip or throat reading). The child that lives in a home where correct language is spoken and who hears good language among his playmates will speak correctly, barring a few inaccuracies resulting from irregularities in the structure of the language. He will learn to syllabicate properly, utter words distinctly, and to give correct emphasis to his expressions. The teaching of language in the schools is often rendered difficult because children have so much to unlearn. Years of imitation of undesirable models counteract efforts in the right direction.

In all language acquisition of the child the most important factor is imitation—at first unstudied and purely absorptive, and gradually becoming conscious and purposive. At first the all-important thing is to have the child hear only the purest of speech. He will then re-echo exactly as he has heard. Later he should not only hear pure speech, but he should become saturated with the forms of the choicest diction expressed in literature. Gradually the beauty of forms of expression in literature should be brought to his consciousness in order that he may rise from the stage of reflex imitation to the higher, studied, idealistic stage. The primary consideration, however, is so to pre-empt the mind with the choicest form and content in literature that spontaneous expression of a similar

nature will follow necessarily as a result of the laws of ideo-motor action.

Properly guarded, even definitely studied imitative reproduction of the best models is of great assistance in acquiring ideal habits of expression. Occasionally when a pupil has read a piece of literature it is well to have him reproduce it with all the imitativeness he can command. For what other purpose has he studied than to make the thought and art his own? So long as the art has become integrated into his own style and is not a borrowed garment put on for the occasion, there is no danger. A careful distinction must, of course, be kept in mind between proper imitation and mere copying. Spontaneity and naturalness are prime desiderata, and are not sacrificed if the language work is made a matter of assimilation and not one of mechanical memory. The models for studied imitation should also be varied and none long continued. The place and meaning of imitation which are here desired to be emphasized are well illustrated in many of the present-day books on composition, in which the basis of composition work is to be the study of the choicest literary models of the various forms of composition.

Chubb says:

> Children learn their native tongue by imitation; and imitation continues to be, throughout the school course, the chief factor in language work. The rules of grammar and rhetorical precept are later and comparatively unimportant means to the end sought. Of models, the most influential is the teacher herself; the influence of book models is heavily discounted if the teacher's own practice is not exemplary and winning. And by example we mean, first and foremost, oral example. (*The Teaching of English*, p. 374.)

He further says:

> Children should learn to write as they learn to swim—by watching and imitating others; by trying under the lead of a model. They develop a feeling and instinct and knack for writing, without which they will never be effective as writers. . . . The child or youth who writes well is he who feels that he has something to say, wants to say

it, and to say it well—to make his point. He naturally falls back, consciously or unconsciously, upon examples known to him. (*Op. cit.*, p. 382.)

The testimony of some really successful writers concerning their method of learning to write should be valuable. Stevenson writes of imitation:

That, like it or not, is the way to learn to write. It was so Keats learned, and there never was a finer temperament for literature than Keats's; it is so, if we could trace it out, that all men have learned. Perhaps I hear some one cry out: "But that is not the way to be original!" It is not; nor is there any way but to be born so. Nor yet, if you are born original, is there anything in this training that shall clip the wings of your originality. There can be no one more original than Montaigne, neither could any be more unlike Cicero; yet no craftsman can fail to see how much the one in his own time tried to imitate the other. Burns is the very type of a prime force in letters; he was of all men the most imitative. Shakespeare himself, the imperial, proceeds directly from a school. Nor is there anything here that should astonish the considerate. Before he can tell what cadences he truly prefers, the student should have tried all that are possible; before he can choose and preserve a fitting key of words, he should long have practised the literary scales—and it is the great point of these imitations that there still shines beyond the student's reach his inimitable model.

Stevenson further says:

Whenever I read a book or passage that particularly pleased me, I must sit down at once and set myself to imitate that quality of propriety or conspicuous force or happy distinction in style. I was unsuccessful and I knew it, but I got some practice in these vain bouts in rhythm, in harmony, in construction, and in co-ordination of parts. I have thus played the sedulous ape to Hazlitt, to Lamb, to Wordsworth, to Browne, to De Foe, to Hawthorne, to Montaigne, to Baudelaire, and to Obermann. (Stevenson, *Memories and Portraits*, p. 55.)

Franklin's early reading gave him a bias toward dogmatic disputation. This was later overcome by imitation of a different style. He found himself lacking "in elegance of expression, in method, and in perspicuity." He then came across a volume of the *Spectator*, which he says:

I read it over and over and was much delighted with it. I thought the writing was excellent, and wished, if possible, to imitate it. With that view I took some of the papers, and making short hints of the sentiments in each sentence, laid them by a few days, and then, without looking at the work, tried to complete the papers again by expressing each hinted sentiment at length, and as fully as it had been expressed before in suitable words that should occur to me. Then I compared my *Spectator* with the original, discovered some of my faults, and corrected them.

To acquire a stock of words and a readiness in recollection and use of them he "took some of the tales in the *Spectator* and turned them into verse; and after a time, when I had pretty well forgotten the prose, turned them back again."

Whom Do Children Imitate?—The fact that children imitate other children more than adults can be scientifically explained. Imitation, as shown before, is fundamentally a repetition of one's own previous experience. Therefore one cannot imitate the experiences of others when they have not been realized as a part of one's own previous experience. This does not mean that they have been realized in their entirety, but at least in their elements. The child, therefore, imitates actions of others that he can understand. If he observes actions which have no meaning to him, there is no tendency to imitate them.

The boy follows the leadership of the livery-stable hand, the corner loafer, or the bandit rather than the leadership of George Washington, because the former are comprehended through experiences acquired through the natural expression of his own instinctive tendencies. The latter is not copied because too remote from his every-day thinking and experience.

Adolescent Imitation.—Imitation is usually considered to be a dominant characteristic of early childhood, but is not regarded as of much significance in youth and adult life. As a matter of fact, imitation is as determinative of conduct in youth as in childhood. The types of imitation are not the same at the different ages. The child's imitation is of the automatic type; the youth's selective, deliberate, and studied.

The youth is more idealistic than the child, and his ideals develop into conduct. The youth is constantly studying and selecting models from people about him in active life, and also from his reading. What boy has not run chasing the ball for the big fellows until ready to drop from exhaustion? How many boys have not been beguiled by some unscrupulous, though to them fascinating, bully into doing things which would horrify their parents and later themselves, simply to meet the approval of their hero?

Were youth not purblind in their hero-worship, no boy would repeat the deathly sickness of his first smoke simply to project himself into his ideal world. No college freshman would don a fool's cap, a dress suit, or a clown's garb and labor six hours rolling a peanut through the main street of the town, appear at chapel in chains, in class in paint more hideous than the South Sea Islanders, or the thousand and one equally inane things, so lacking in fun for adults that even the street-laborers will not turn their heads to look. We should not bewail such actions nor pronounce censure, but we should understand the mental attitude. Those are perfectly normal states for those ages, and will be moulted in due time.

College government largely depends upon the sentiment espoused by the students themselves. Faculty rules are insignificant in comparison with the laws enunciated by the leaders of the classes. High-school pupils, though not so assertive, idealize and idolize even more blindly. What is more suggestive of the cataleptic trance than the high-school boy in love, especially with some one old enough to be his mother?

Because of this blind and excessive fidelity to a course of life once assumed, it behooves the guardians of youth to provide desirable copy for the youth to imitate. Many a youth's aim has been low through life simply because he has too early idolized unworthy copy. It is highly important that boys and girls both see something of the world outside their own circumscribed community before developing too fixedly their ideals of life-work and especially of life companions. Savon-

arola was saved to the world for a monumental work because the ignorant shepherdess rejected his suit when he was a callow youth. His wanderings caused by his fancied dejection gave him an enlarged horizon and higher ideals.

To get an idea of imitation among adolescents, one needs only to observe any adolescent boys or girls with whom he may come in contact—their behavior in general, in school, their manner of reciting in the classroom, their actions on the street, in the home, at church, at a party, in any situation where groups are thrown together. I have frequently watched a group of high-school pupils on their way to school, and have noted the same fashions in dress, in wearing the hair, and in slang expressions. If one wears an overcoat, it is because the rest do, not because necessary; if one carries an umbrella, all must do so. Sometimes all ride in the street-car; at other times every one walks and one would scorn to ride. Just now all carry their lunches in a crumpled paper sack folded in an approved fashion and carried in a certain way. One would stay out of school rather than carry a neat lunch-box. The songs they sing, the phrases they use, the movies they attend, the shows they praise or taboo, the popular football heroes they acclaim, the things they approve or decry, all are largely the product of unstudied imitation which they have caught from the crowd.

It is usually believed that children imitate their elders, but a moment's consideration shows this to be a superficial observation. Whom do the high-schoolers imitate in their dress, their speech, their attitudes, and their prejudices? Whom do the college freshmen copy? There is certainly a wide distance between the dress of the freshman and the professor. In the ideals espoused, the conduct followed, who are their patterns? One who knows a college campus or classroom is not misled into the wrong answer. The youth's everyday associates are the ones that slowly but surely determine his actions, his habits, his ideals.

Imitation in Developing Personality.—The teacher needs to observe carefully the effects of varying impressions upon the

class. Warner tells us: * "The sight of your movement brings into activity the same combination of nerve-centres as you use. This is one means by which you determine action in the child's brain." Because children are such imitators of each other they unconsciously secure some sort of education. Care must be exercised to exclude undesirable companions, those with either physical, mental, or moral defects. Cases are numerous in which those afflicted with diseases such as St. Vitus's dance (chorea) have caused others to become afflicted solely through imitation. Stammering, hysterics, and even ordinary fright become epidemic. Children possessing tendencies toward excitability and overmobility should be with children having good self-control. By imitation of these latter the pathological tendencies may disappear. Yawning, gaping, coughing, restlessness may become infectious in a class. Every word, gesture, peculiarity of walk, facial expression, intonation of voice, are certain to be absorbed and unconsciously or purposely represented in action. Thus habits of language become universalized in a school or community, a certain type of manner becomes typical of a school, certain methods of study and recitation often characterize a system or schools. In one place recitations are clear-cut, intelligently rendered, while in another school they are always disconnected, mumbled, and indistinct, and rendered with no apparent pride. Even an excellent teacher cannot model things to his own liking if the custom does not sanction his way. A splendid teacher once failed in a country school because he insisted on having boys remove their hats during the recess while in the schoolroom. Each one simply imitated a prevailing custom, and they rebelled against any deviation. Put the most obstinate of those boys in a school where custom dictated baring the head indoors, and see how quickly he would uncover, with never a word of opposition.

Through imitation the child is to absorb many of the most valuable lessons of life. All the elements that go to make up what we term "bearing" or "personality" are largely prod-

Mental Faculty, p. 89.

ucts of imitation. To a large extent one's character is determined imitatively by the company one keeps. It is frequently true that ideals of life and conduct are imitative reflections more than particular intellectual acquisitions. Emotions are especially contagious. Attitudes toward life and its various problems are taken on through inoculation when the reasons therefor are not at all apparent. As nearly all the world's great wrong-doings, resulting in robbery, embezzlement, drunkenness, poverty, pauperism, vice, divorce, murder, and suicide, result from a distorted view of life, duty, and happiness, it becomes highly important to radiate ideals which shall counteract the distorted ones.

Idealistic Imitation.—Not only do we imitate directly others around us, but we also do many things indirectly because of ideals gained through sermons, lectures, chance remarks, and through reading. We are apt to discount the potency of reading to determine conduct. It is indeed true that much of the youth's reading seems to make little impression upon his conduct. But when we so interpret it we are thinking of immediate responses. It may be that the ideas absorbed to-day will not express themselves to-day, nor to-morrow, nor next week; but they may be the mainspring of action next year or ten years hence. If not inhibited by counter-tendencies from opposing ideas, they will inevitably result in conduct that becomes a part of the warp and woof of character itself. The prose poet has said: "Sow a thought and reap an act; sow an act and reap a habit; sow a habit and reap a character; sow a character and reap a destiny."

Even long after childhood days "unconscious education" is the most influential in shaping destiny. We think of education as the resultant of studied set lessons, but this is because we are prone to measure education by stereotyped facts that can be displayed on examination days. But the really vital education is that which results in modes of behavior, attitudes, feelings, prejudices, wills, strivings—character.

Social Responsibilities because of Imitation.—The laws of imitation place great responsibilities upon every individual in

society. Every one, unless isolated even more than Robinson Crusoe, is a part of somebody's environment. Every action has some influence upon others as well as upon oneself! Thus is each one his brother's keeper. When we come to understand the influence of others upon us, the influence other children exert upon our children, we shall then be more solicitous to secure only wholesome, elevating surroundings for ourselves and our children. We shall be almost as deeply concerned to educate our neighbors' children properly as we are about our own, for in the widest sense we cannot educate a given individual properly without suitable environment. Every man is a product of the time in which he lives. A great statesman cannot be produced without a great state. A great scholar rarely lives in an unscholarly time or place. Therefore every parent who wishes to educate his children in intellectuality, morality, and virtue must seek those conditions as an environment. No one who desires to educate his children properly moves to the slums; no, he moves where culture is highest, not because good teachers are not obtainable for the slum districts, but because of all other contributory factors. While many seek these conditions, few realize their duty in creating them.

Imitation in School Government.—It has been said that as the teacher so is the school, and no doubt Channing was right when he said that "a boy compelled for six hours a day to see the countenance and hear the voice of a fretful, unkind, hard, or passionate man is placed in a school of vice." But I am inclined to think we overrate the teacher's influence and underrate the influence of pupil companions. A study of what children imitate most has revealed to me that children imitate other children, usually those slightly older than themselves, more than they do adults. Let a few children become interested in some new game or play, and it usually spreads over a city. From time to time there are epidemics of playing marbles, tops, circus, jack-o'-lanterns, football, baseball, shinny.

The particular code of honor in a school, the things that are tabooed and the general moral tone of the school also de-

pend far more upon the school community than upon the teacher. We send our boys to be educated by the schoolmaster, but the schoolboys educate them. The moral tone of a school is very much affected by imitation. If a teacher can secure the co-operation of a few real leaders, it does much more to change the moral tone than any amount of lecturing or preaching. Get a few leaders started and the effect spreads like contagion. The teacher must always see to it that the leaders, those whose opinion is deemed important, are on her side. Public opinion is largely the opinion of leaders. This is true in politics, and equally true in school circles. This public opinion is a most powerful shibboleth. Let the teachers keep the leaders sympathetic. She can then run their opinions into any desired mould. With the leaders enlisted on her side and the cause of right, and school government is an easy affair. The hearts of the multitude cannot be entirely changed all at once. Other counter-influences may be strong, but when once the wide-spread influence of imitation is recognized, when it is comprehended that we are to imitate whether we will or not, there will be much more attention paid to the "copy" that is placed or allowed before children.

It is not a new thing for solicitous parents to try to keep bad and vicious companions away from their children, but they usually think little of the positive effects of good copy. The right kind of playmates for a child in its impressionable years may save many school bills and even doctors' bills. It takes years and many schoolmasters to teach what ought to have been gained silently, surely, unthinkingly from right surroundings, and to help unlearn the undesirable things learned by the same inevitable process.

Take, for example, the code wıtn respect to "tattling." While any fair-minded person would denounce the kind of tattling which informs for the selfish satisfaction of getting the other fellow punished, yet not to inform against an enemy to common welfare is to be a silent partner to the crime. This was emphasized during the World War. To be an informer against all enemies of the public is one of the most fundamen-

tal civic virtues. Yet a foolish misinterpretation of the literal expression has become a false code of honor, fostered in school and perpetuated in civic life. Many shrink from attempting to right public abuses because the injury has not become so personal as to be felt. The public business becomes no part of any individual's business. As in school they felt it to be the teacher's business to right evils, they now turn it entirely over to the police, and then grumble at the corruption in public affairs. One can be a flagrant sinner "by minding his own business." There are sins of omission as well as of commission. Our greatest civic sin is neglect of the public weal. While we fold our hands, stop our ears, and blind our eyes the council barters away the franchise, the sheriff pockets his usurious fees, the tax-collector keeps all that sticks to his fingers, the money kings hide their taxable property, the corporations swindle the patient public, and the patent-medicine man saps the life and vigor from the commonwealth. We know all these things are going on, but we believe in "minding our own business." Children must be taught in school that one who permits without protest any wrongs against the welfare of the school is a public malefactor.

Nearly all the rules, regulations, and machinery of government in school are in point of importance and efficiency of minor worth when compared with the public opinion of the school. The school is what its pupils sanction. The teacher who succeeds in inculcating in the pupils' minds high ideals of the relations the pupils should bear toward the school will have no difficulty in government. Many schools, regrettably, have never glimpsed true ideals of these relations, because the narrow teachers themselves have not comprehended them. The teacher who comports himself as a policeman and detective is surely imitated in his ideals, and usually plays a sorry game.

We hear much about self-government in schools. The tendency is to evolve a complex system of machinery whereby the pupils may themselves enact and execute laws and even punish offenders for their infraction. No system of school

governmental machinery, however, can secure self-government of itself. The only secret worth striving to discover is that of securing a feeling of mutual ownership of the school. That secured, the machinery is rendered largely unnecessary. Pupils are too apt to feel no sense of partnership in the school and no sense of responsibility for its good name. School public opinion has thrown the whole responsibility upon the teachers, and instead of feeling happy in the success of the school the pupils have even felt a secret delight in the failure of what is to them some one else's affair. False codes of honor are by no means uncommon. Many a boy who would sooner cut off his right hand than inform the authorities of offenses against their mutual welfare would not hesitate to "crib" from his neighbors on examination. No teacher can abolish cribbing, hazing, or bullying by an edict, but once let him create a public opinion against it, and woe to the offender. Even little children will often commit flagrant disobedience of parents' commands rather than disregard the mandates of the public opinion of their own circle.

We are told that Mrs. Jacob A. Riis was a past master in utilizing imitation in reforming gangs of hoodlums in New York and Brooklyn. She would go to the leaders of the gangs, who might have their rendezvous under the sidewalks or in back-alley shacks, and say to the leaders: "I would like to come to your meetings and become a member of your club." Because of her winning, magnetic personality, they would allow her to go. She would enlist the help of the leader, who forthwith became her valiant knight, vowing vengeance upon any who did anything to displease his heroine. The crowd would then all swear allegiance to their leader.

Public Opinion among Boys.—William Dean Howells has glimpsed the unseen force of public opinion which reigns in the boy's world and has given us a delightful picture of it in *A Boy's Town*. He writes:

Everywhere and always the world of boys is outside of the laws that govern grown-up communities, and it has its unwritten usages, which are handed down from old to young, and perpetuated on the same

level of years, and are lived into and lived out of, but are binding, through all personal vicissitudes, upon the great body of boys between 6 and 12 years old. No boy can violate them without losing his standing among the other boys. . . . He must do this, and must not do that; he obeys, but he does not know why, any more than the far-off savages from whom his customs seem mostly to have come. . . . There were some things so base that a boy could not do them; and what happened out-of-doors, and strictly within the boy's world, had to be kept sacredly secret among the boys. For instance, if you had been beguiled, as a little boy, into being the last in the game of snap-the-whip, and the snap sent you rolling head over heels on the hard ground, and skinned your nose and tore your trousers, you could cry from the pain without disgrace, and some of the fellows would come up and try to comfort you; but you were bound in honor not to appeal to the teacher, and you were expected to use every device to get the blood off you before you went in, and to hide the tear in your trousers. Of course, the tear and the blood could not be kept from the anxious eyes at home, but even there you were expected not to say just what boys did it.

They were by no means the worst boys who did such things, but only the most thoughtless. Still, there was a public opinion in the Boy's Town which ruled out certain tricks, and gave the boys who played them the name of being "mean." One of these was boring a hole in the edge of your school-desk to meet a shaft sunk from the top, which you filled with slate-pencil dust. Then, if you were that kind of a boy, you got some little chap to put his eye close to the shaft, with the hope of seeing Niagara Falls, and set your lips to the hole in the edge, and blew his eye full of pencil-dust. This was mean; and it was also mean to get some unsuspecting child to close the end of an elder-wood tube with his thumb, and look hard at you, while you showed him Germany. You did this by pulling a string below the tube, and running a needle into his thumb. My boy discovered Germany in this way long before he had any geographical or political conception of it.

I do not know why, if these abominable cruelties were thought mean, it was held lawful to cover a stone with dust and get a boy, not in the secret, to kick the pile over with his bare foot. It was perfectly good form, also, to get a boy, if you could, to shut his eyes, and then lead him into a mud-puddle or a thicket of briers or nettles, or to fool him in any heartless way, such as promising to pump easy when he put his mouth to the pump-spout, and then coming down on the pump-handle with a rush that flooded him with water and sent him off blowing the tide from his nostrils like a whale. Perhaps these things were permitted because the sight of the victim's suffering was so funny. Half the pleasure in fighting wasps or bumblebees was in killing them

and destroying their nests; the other half was in seeing the fellows get stung. If you could fool a fellow into a mass-meeting of bumblebees, and see him lead them off in a steeplechase, it was right and fair to do so. But there were other cases in which deceit was not allowable. For instance, if you appeared on the playground with an apple, and all the boys came whooping around, "You know *me*, Jimmy!" "You know your uncle!" "You know your grandfather!" and you began to sell out bites at three pins for a lady-bite and six pins for a hog-bite, and a boy bought a lady-bite and then took a hog-bite, he was held in contempt, and could by no means pass it off for a good joke on you; it was considered mean.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Distinguish between conscious, purposive imitation and reflex imitation. 2. Think of some habits you have acquired by intentionally imitating some one else. 3. Think of some habits you have "picked up" unintentionally (*a*) by accidentally imitating yourself and (*b*) by accidentally imitating others. 4. In which manner have you acquired the largest fund of habits? 5. Analyze the place of imitation in learning handwriting. (Be sure to recognize the place of autoimitation in the process.) 6. To what extent may imitation be employed in teaching (*a*) foreign languages, (*b*) composition, (*c*) drawing? 7. Show the place of imitation in our everyday thinking. 8. Have you noticed the effects of imitation in creating a school atmosphere? 9. Of what value is imitation as a means of promoting school government? 10. Notice boys and girls in school and on the way to school. Note several things they imitate very slavishly. 11. Have you ever observed any "propaganda" of any kind, good or bad, spread just to cause people to imitate an attitude of mind? 12. What agencies are most powerful in securing imitation and creating public opinion? 13. Whom do children imitate most?

References for Further Reading

1. Bolton, *Principles of Education*, chap. XVI.
2. Tanner, *The Child: His Thinking, Feeling, and Doing*, chap. XV.
3. O'Shea, *Dynamic Factors in Education*, chaps. VI, VII.
4. Baldwin, *Mental Development*, chaps. IX, X, XI, XII.
5. Norsworthy and Whitley, *Psychology of Childhood*. See Index.

CHAPTER XIV

IMAGINATION IN LEARNING AND EXPRESSION

Popular Meaning of Imagination.—While the imagination may be concerned with the creation of air-castles, its most fundamental process consists in repicturing objects which have been actually perceived through the senses. According to the popular meaning, imagination means fancy, thinking of things that do not actually exist. We sometimes indulge in day-dreams in which we allow the mind to wander unchecked from one fanciful idea to another. Sometimes we experience illusions in which we fancy that we see, hear, or feel something which in reality had no existence. Again our memories often play us tricks causing us to think that we have had certain experiences when we have not. In all of these illustrations we speak of the mental states as cases of imagination. This will pass very well for very general meanings of imagination, but for educational purposes we need a much more accurate, scientific definition.

Scientific Meaning of Imagination.—Look at your pencil, touch it, or allow it to drop on the floor. While you see it, touch it, or hear it, you are at that moment perceiving it or receiving a percept of it. Look away from the pencil and you now have a picture of it. See if you can represent the sound of it as it fell to the floor; the weight of it as it lay in the hand; or the smell and taste of the cedar-wood. See if you can recall definitely the appearance of a silver dollar. See if you can hear it ring as it is dropped on the table. These revived pictures of the sight, sound, taste, weight are not percepts because the objects are not present to any of the senses. They are copies of the percepts. They are termed images. Hence the definition: *Images are copies of percepts*. And the process of imagination should then be defined as follows:

Imagination is the process of forming images. Titchener says (*Primer of Psychology*, p. 201):

> Imagination is imaging. And imaging a thing is thinking of it in kind: a tree is imaged by a visual idea, a piano note by an idea of hearing, running to catch a train by a tactual idea; the ideas are the same in kind as the perceptions which they represent. In this sense, a mind is more or less "imaginative" according as it is better or worse constituted to think of things in kind; and the primitive mind—the mind whose ideas are photographic copies of perceptions—is the most imaginative of all.

Illustrations.—Many persons think they imagine clearly, when, in fact, their imagery is very dull, or possibly lacking. Try to picture clearly through visual imagery your home when away from it; the schoolhouse and the church you attended as a child. See if you can visualize your mother, your father, a distant friend. Which is clearer, the image of the persons as you have actually seen them, or the image of some photograph of them? Why? The following is a capital test of visual imagery: Imagine a three-inch cube. Paint it blue. Imagine it cut into inch-cubes. How many cuts were necessary? How many cubes? How many cubes have no paint? How many have paint on one side only? How many have paint on two sides only? On three sides only? On four sides? Draw from memory the picture of the print of a dog's foot as it appears in the snow or mud. Draw from memory a hen's track. Draw from memory your watch-face. Look for a moment at some unfamiliar wall-paper or decoration, and then turn away and see if you can describe or draw it.

Try to revive the exact sound of a friend's voice; the sound of the old school-bell; the music of "America" as sung by a chorus, as played on a piano, on a violin, by an orchestra, or by a brass band. Revive the sensations produced by filing a saw, a step on the walk, or the splashing of water. If a product of imagination, each revival must be specific and concrete. It is not enough to know that we have heard the music, to feel that we could reproduce it, or to be sure that we should recognize it, if heard. It must be revived in con-

sciousness so that it is a reproduction of what has actually been experienced in sense-perception. To further test the power of imagery try to image the odor of violets, roses, onions, old books, new-mown hay, or a clover-field. How closely do the images approximate reality? Try to imagine the taste of pickles, coffee, roast beef. Without looking at the hand, see if you can feel a glove upon it. Think of an ant crawling on the back of the neck, or a fly walking over the face. Do the images become so real as sometimes to become confused with actual sensations? How would it feel to bite a rusty nail, to touch a snake or a sand-bur?

The student who looks through the microscope, turns away, and draws accurately what he has seen must have a visual image in his mind of what he has seen. The more accurately he can represent the object, the more perfect his image. Many never portray well what they have seen because their imagery fades. They are sometimes unjustly accused of not seeing accurately. The child who makes an excursion to the field, forest, or quarry, and on returning revives pictures of what he has experienced is imaging, *i. e.*, is employing the imagination. To examine a hydrostatic press, a battery, a Wheatstone's bridge, a clam, a crystal, or a fern, and then to recall exactly what has been seen is to imagine. To listen to a note sounded by the director's tuning-fork and then hold it in mind long enough to sound the same is to imagine. To examine the color and texture of a piece of cloth and then to go to the store without the sample and match it is to hold in mind an image—to imagine.

The musical composer must hear each note as it will sound when executed. He must differentiate the various parts and hear each voice or each instrument as it will appear in the rendition. In singing it is necessary to image the sound before it is produced. Thus a train of imagery runs in advance of the actual rendition. If a discord should be imaged for an instant, that discord would be reproduced. This is just as certain as that when a bicyclist thinks of an obstacle he is certain to steer toward it. The image is held before the mind

and largely determines execution. The architect who plans a building must see every part in imagination before he constructs his drawings. The carpenter who builds without a definite pattern-drawing must see each room, each door, each stairway, each pipe and fixture as they will be arranged, if mistakes are to be avoided. Try some time to imagine a change in the stairway of your house, a change in the roof or the furnace, and note how definitely it must all be imaged.

Consider what is necessary before a child can appreciate through full imagery the following:

> "O robin in the cherry-tree,
>   I hear you carolling your glee!
> The platform where you lightly tread
>   Is lighted up with cherries red,
> And there you sit among the boughs
>   Like Patti at the opera-house."

Relation and Difference between Memory and Imagination.—It will be necessary to distinguish between imagination and memory. As we shall more and more come to appreciate, mental life is a unity, and not made up of entirely separate faculties or powers; hence, memory and imagination will be found to be very closely related forms of mental life. We shall find, moreover, that they overlap each other. In their well-marked higher stages it will not be difficult to distinguish the two, but in indefinite stages they will be found to be indistinguishable. Distinguishing between memory and imagination, between sensation and perception, between intellect and will are much like making exacting distinctions between plants and animals. It is perfectly easy to determine to which kingdoms trees and horses belong, but when we come to sponges and the protozoans the task is more difficult and even baffling. No one can say that a given sensation has no element of perception in it, nor in a given percept can one entirely separate the perceptional element from the sensational. The difference between memory and imagination can perhaps be better felt than expressed. In order to understand the dif-

ferences each individual must experience them for himself. Certain hints may be given, however, to enable the learner to identify the states in his own consciousness. In memory we recognize the following factors:

registration retention	necessary factors.
reproduction recognition localization	possible factors, and present in all complete memory.

In imagination the following factors are to be considered:

registration retention reproduction	necessary factors.
recognition localization	possible factors, and present in all complete imagination.

We can image only individual ideas, not concepts; they can be remembered. Again, memory deals with the past only. Imagination deals with the past, present, or future. One may remember his yesterday's dinner. He may also imagine it. One may imagine the morrow's dinner, but he cannot remember it. He has not experienced it and cannot therefore recall it. Imagination is simply a more vivid form of recall. As above illustrated, if you can recall or produce in mind an idea of an object so vividly that it seems almost as if the object were present, then you have an image. If it is dim and hazy and indefinite, you have a memory.

Dream Images and Illusions.—The best examples of imagery come to us in dreams. We see things, hear things, touch things, and even taste and smell things in such a vivid way that they seem real. For the time they are just as vivid as the actual experiences would be. Temporarily we are deceived into believing them real. Sometimes similar phenomena occur in normal waking life. We imagine we see things,

hear sounds, such as voices, or bells, etc. We imagine we feel things when there is no stimulation of the sense-organs. Usually there may be a suggestive factor in some actual sensations, but the images that arise are very much stronger than the stimulation would warrant. Children, savages, and superstitious people are prone to experience hallucinations upon the suggestion of the slightest stimuli. Darkness and lonesome places heighten the suggestibility. As De Quincey says: "Many children have a power of painting, as it were, upon the darkness all sorts of phantoms." Insanity is little else than a species of disordered imagination. The abnormal mind, possibly through suggestion, sees visions, hears voices, and feels touches, which in a sane condition would not be experienced.

Types of Imagination.—Viewed from the standpoint of the senses employed, there are as many types of imagination as there are sense-perceptions. When we image in terms of sight we are using visual imagination, when we image in terms of sound we are using auditory imagination. Touch images are in the realm of tactile imagination, taste images in the realm of gustatory imagination. As will be shown in a succeeding paragraph, these powers vary in different individuals.

From the standpoint of the combination in the product we may speak of imagination as *reproductive* and *productive* or *constructive*. When perceptions are revived exactly as experienced, they are reproductive; when recombined into new wholes, productive or constructive. Of course, all constructive imagination depends absolutely upon the reproductive. The degree of real constructiveness depends upon the accuracy of the reproduction of the parts and the consistency and originality of the new whole. Merely recombining with consistency of relations does not indicate a high degree of constructive imagination. Both imagery and real constructive thinking are necessary to real constructive imagination.

Limitations of the Imagination.—The imagination is limited to the use of materials already in the mind. Sense-perception must furnish the elements, the raw material out of which the

imaginative product is produced. This is true in the case of the highest creative imagination as well as the lowest form of mechanical combination. It may be stated as a law that *no product can be imagined the elements of which have not come through sense-perception.*

Helen Keller, deaf and blind, does not image colors or sounds as normal persons do. Extravagant newspaper stories are told of her marvellous powers of seeing colors through her finger-tips and hearing sounds through her feet. But she does not in reality see colors, hear tones, or even imagine them. She says: "I talk about colors as if they were realities to me, but they are just words." These facts are of much importance in education, for if we wish to have pupils imagine, we must be sure that they have had the sense-perceptions.

One born blind cannot imagine color, nor one born deaf imagine sound. Among the blind it has been found that those who became blind before the age of six or seven never dream of colors, while those deprived of sight at a later age frequently have dreams in which color is a factor. The necessity for sense-elements out of which to construct the new picture is well illustrated in the case of Sir Walter Scott, a writer of most vivid imagination. In a visit with Mr. Morritt, Scott said to his host with reference to some facts which he had given to Scott: "You have given me materials for a romance; now I want a good robber's cave, and an old church of the right sort." "We rode out," says Mr. Morritt, "and he found what he wanted in the ancient slate quarries of Brignal and the ruined abbey of Eggleston. I observed him noting down even the peculiar little wild flowers and herbs that accidentally grew round on the side of a bold crag near his intended cave of Guy Denzil; and could not help saying that, as he was not to be on oath in his work, daisies, violets, and primroses would be as poetical as any of the humbler plants he was examining. I laughed, in short, at his scrupulousness; but I understood him when he replied that in nature herself no two scenes were exactly alike, and that whoever copied truly what was before his eyes would possess the same variety in his descriptions, and exhibit apparently an imagination as

boundless as the range of nature in the scenes he recorded; whereas whoever trusted to [constructive and not accurate reproductive] imagination would soon find his own mind circumscribed, and contracted to a few favorite images, and the repetition of these would sooner or later produce that very monotony and barrenness which had always haunted a descriptive poetry in the hands of any but the patient worshippers of truth." (Carpenter, *Mental Physiology*, p. 492.)

The foregoing also illustrates the fact that in the best so-called imaginative literature the finest descriptions are more true to life than ideal. The salient characteristics which have been selected for the scene characterized must be true to life. It is said that Scott's characters "are felt by those who are well acquainted with the Scottish life of the past to be so intensely *natural* that every one of them *might* have been a real character. And the same is true of the best of Dickens's and of Thackeray's imaginary constructions, in which these great humorists have so completely identified themselves, as it were, with the several types they delineated, as to make each of them speak and act as he (or she) would have done in actual life. It is certain, indeed, that most of these (as in Walter Scott's case) are developments of actual types, while those which are purely *ideal*—the work of the *creative* rather than of the constructive imagination—lack 'flesh and blood reality.'" (Carpenter, *op. cit.*, p. 502.)

Burroughs says of Tennyson:

> A lady told me she was once walking with him in the fields when they came to a spring that bubbled up through shifting sands in a very pretty manner, and Tennyson, in order to see exactly how the spring behaved, got down on his hands and knees and peered a long time into the water. The incident is worth repeating, as showing how intently a great poet studies nature.

After knowing these habits of the great poet, we can readily understand why he could pen such an exact simile in the lines

> "arms on which the standing muscle sloped,
> As slopes a wild brook o'er a little stone,
> Running too vehemently to break upon it."

Individual Differences.—There are manifestly very great individual differences in the power of imaging. Some possess a good imagination for all classes of sense-percepts, others possess remarkable powers in a certain class, as sight, and still others are almost devoid of any powers of vivid imagery. The classic investigations of Sir Francis Galton for the first time revealed these striking individual differences in mental processes. To the psychologist of to-day the fact that people are incredible about such differences is the strangest thing. That such mental differences exist is no more strange than that some people are tall, some short, or some red-haired and some black-haired. But the popular mind is slow to recognize that mind is the greatest variable in existence.

Some people are wofully lacking in the power of visualization. Such persons cannot draw, would not be good architects or designers, can invent nothing, and probably cannot build anything so that the joints and parts fit. They could not make a success of real geometry study. They might memorize demonstrations but not fully comprehend them. It frequently happens that a boy is a great success in algebraic mathematics and an equal failure in geometric mathematics. Success in the latter demands a high type of visualizing power. Similarly many boys bright in geometry, drawing, and natural science may make signal failures in their music. To achieve success in music requires especial powers of auditory imagery. Successful designers of wall-paper, carpet patterns, furniture, textile patterns, decorations, fresco-painters, milliners, dressmakers, tailors, architects, and inventors must all have good powers of visual imagination. One who possesses special powers of visual imagery should seek an occupation giving opportunity for its employment.

The possessor of a notably vivid auditory imagination should turn to music, language, or some occupation demanding fine powers of auditory discrimination. No one has ever become a skilled linguist without ability to detect fine shades of sound differences and the power of revival through imagery. The possession of vivid tactile imagery is rare. Frequently it is

developed in the blind because of the lack of visual imagery. To be able to revive tactile perceptions accurately is a rare gift. The great surgeon owes his skill largely to this power. Artistic skill in drawing, painting, or sculpture depends much upon tactile imagery. Inventors, architects, and landscape-gardeners owe their success largely to visual imagery.

The great musical composer must hear every instrument and every voice and every note to be produced by each before he really composes the new production of his imagination. Mosso says:

> An able dramatic writer once told me that when he composes he has to shut himself up in his study because he is obliged to make his characters continually talk aloud. He receives them as if on the stage, shakes hands with them, offers them a chair, follows them in every little gesture, laughs or cries with them, as occasion demands. When he writes, he always hears the voices of his actors.

Children's Imagination.—Oftentimes children are said to have better imagination than adults. This is true only in relation to vividness. While the child's imagination is very vivid, it is very inaccurate. Children's stories are vivid but incoherent. One of the things training should do is to increase accuracy, that is, consistency.

The child usually possesses vivid imagery, but the images lack accuracy. The child also lacks voluntary control of his images and trains of thought. Consequently, the child's fancy is flitting, incoherent, inconsistent, and ineffective. The child thinks out very fanciful stories, but they would hardly make a consistent piece of fiction. It is only with effort and through training that the adult is able to control thoroughly his imagination. It is erroneous to regard the child's imagination as being better or stronger than that of the adult. The unbridled play of fancy in the child causes his ideas to run riot, and as imagination is so frequently made identical with fancy, his imagination has come to be regarded as stronger than that of the adult.

Throughout childhood, while sense-perceptions are relatively

stronger than any other powers, all forms of sense imagery are very vivid. So vivid are the child's imaginations, and so little reflective is he, that illusions are easily created. The child is extremely suggestible, *i. e.*, he easily seizes upon the merest sign and through his vivid imagery builds up creations which would not appear to more mature persons. Careful studies have been made on the suggestibility of children. It has been found that children can be caused to see things, hear things, smell, taste, and touch things that have no objective existence. The word or some sign was sufficient to arouse the brain centre controlling the particular function. (See Maurice H. Small on "The Suggestibility of Children," *Pedagogical Seminary*, 4: 176–220.) The degree of suggestibility is greatest in the first grade and decreases with age. That is, imaginative products are much more often mistaken for real perceptions in early childhood than in later life.

This child-world is not a product of creative imagination, but one of reproductive imagination. His world is a reflection of the experiences he has been able to drink in. I have no evidence that there are great flights of fancy in which inexperienced scenes and situations are marshalled together. The child plays with dolls, and although these often crude objects are imaginatively made instinct with life, yet the child does with them and has them do only what she has seen her mother or the nurse do with the baby. The little mischiefs play school, and in so doing impersonate different individuals. One assumes the rôle of teacher while the others are pupils. The play pupils (imitating) sit obedient to the dictates of the teacher, with now and then an (imitative) infraction of the rules. They are punished in an approved (imitative) fashion, *i. e.*, in the fashion which the real teacher of their acquaintance punishes. They seldom assume rôles not imitative. Sully says that the "impulse to invent imaginary surroundings" is very common. In fact, he denominates all plays which are dominated by the imagination as creative or inventive. Through my own personal observations I am not able to confirm this position. Moreover, I have failed to find in all of

Sully's or Baldwin's examples of imitation any that give evidence of much, if any, inventiveness on the part of children. In childish lies we have some inventions for the purpose of avoiding consequences, but during play the child is attempting to mirror truthfully the world as he understands it. To be sure, the child builds perfect products from the crudest materials; a stick or a chair or his own body serve equally well to be transformed into a dashing steed. There are no obstacles between the raw material and the flawless product. His inventive powers are little taxed in the transformation. He pictures a desired end and presto! it is secured.

In playing with her dolls the little girl, though living a life which she knows is make-believe, is a faithful imitator of the mother or nurse. The little mother of four summers is heard to say: "Oh, mercy! baby must have a clean dress on; but all are in the wash. Does you want your cloak on too?" When a child harnesses the chairs, calls them horses, and makes himself the driver, he imitates very closely the action of the real driver, whom he has seen. A child who has never seen equestrians will never ride an imaginary broomstick horse. A boy whose father had a lariat and used it in lassoing horses was continually seen with a noosed rope playing at the capture of animals.

Because of the vivid manner in which children image things, a caution needs to be given against telling the child things which will be magnified into terrorizing objects. All stories of bad man, the bogie, big bear that will catch you, wolves, tramps, robbers, or future punishment, should be religiously avoided. Many children are made timid and retiring throughout life because of injudicious stories of bogie-men and spooks. If the child could understand that they are fiction he would not be troubled, but imagination becomes belief, and often a belief haunts one as a lifelong spectre. Even stories of such harmless and well-disposed genii as Kris Kringle or Santa Claus should be told properly.

This great activity and vividness of the child's imagination, coupled with the fact that every imagined product deepens im-

pressions on the brain and in the same way that original perceptions do, suggests that this power should contribute much to the education of the child. Not only may intellectual lessons be reinforced, but we may emphasize if not actually create moral tendencies by stimulating the child's imagination in right directions. Just as bodily health or disease may be induced through the imagination, may we not induce mental health or disease by imaginative stimulation? Ideas held before the mind tend to result in the corresponding activities, hence the desirability of holding only correct ideas (ideals) before the mind. Harboring immoral imaginations will tend to convert them into beliefs, and we *are* what we believe. How to control properly the imagination is a question second in importance to no other in the realm of intellectual training.

What Training Involves.—Training the imagination may concern itself with either the increasing of a power of vivid recall or with the control of the train of imagery into desired channels and thus lead toward the creation of new and original combinations. From the discussion of the psychological meaning of the imagination it can readily be inferred that the key to its training lies in the proper development of sense-perception. To formally state it, there are requisite: (1) An opportunity for abundant sensory experience; (2) judicious guidance and direction along proper channels; (3) sufficient exercise in reviving actual experiences; (4) practice in building accurately imaginary pictures painted by another, as in literature, geographical descriptions, etc.; (5) attempts at constructive imagination.

A person with a well-developed imagination can repicture clearly, vividly, and accurately a great variety of perceptions which have been gained through personal experiences. He also has the ability to recombine his imagery so as to construct new pictures out of the elements of reproductive images. A well-trained power of imagination enables the possessor in addition to voluntarily hold before the mind any selected images and to exclude others. Through voluntary selection of imagery the trained individual is able to reproduce his im-

agery for advantageous consideration and to recombine elements into logical, consistent trains of imagery and thus lead to the construction of new and original combinations.

Recognition of Individual Differences.—In view of the fact that there are great individual differences in the power of imagery, the question arises whether we should attempt to develop the special talents or supply deficiencies and try to secure equal powers in all directions. Three of the types undoubtedly have become of greatest importance in our lives. These are the visual, the auditory, and the muscular, and an attempt should be made to secure at least a medium degree of proficiency in reproducing each of these classes of images. The senses of taste and smell are not so absolutely essential, but, however, unless the sense-organs are defective they should receive training, as the pleasures of life may be much enhanced by being able to recall images in terms of these senses. Greater enjoyment may be derived through the normal development of all the kinds of imagination, and the general mental efficiency may be increased.

These individual differences in imagination should be recognized in education. The kind of imagination one possesses often determines his success in a given subject of study or in a given occupation in life. The type of imagination possessed by a pupil may also determine his method of studying particular subjects. One child learns spelling best by visualizing, another by auditizing, another by reproducing the ideas in motor terms. One learns best what he reads by reproducing it visually, another by reviving the sound, another by feeling the action of the vocal cords or the muscles involved. I know of two children who took piano lessons. One of them can play from memory without the notes anything once mastered; the other must always have the written music, or she cannot reproduce any of the lessons. The first has good auditory imagery, the other is very lacking in this type, but depends upon visual and motor imagery.

Imagination in Geography Study.—No subject should be studied merely to give exercise in imagery. The images ac-

quired should be worth while and imagination should be a means of acquiring a knowledge of the subject. Geography is one of the subjects which can only be acquired accurately through the use of imagination. It is not by taking wild flights of fancy in geography that the imagination is used, but in the definite and accurate revival of experiences gained through sense-perception.

Let us take a specific example for illustration. Suppose the pupils were studying the port of Seattle. The first step would be to have the pupils visit the municipal docks, terminals, and warehouses. They should see, hear, touch, measure (through walking and climbing) the many things and relations there. They will see immense docks and warehouses with mammoth steamships loading and unloading; a harbor with liners flying flags of every great nation of the globe. They can see the trucks, giant cranes, hear the ceaseless clanking of chains, smell the fishy smell. They may see the cargoes of wheat, cotton, and peanuts, tons of iron, rolls of paper, giant timbers, tropical fruits, arctic furs, stacks of shingles, and, in fact, commodities from every corner of the globe. They should observe how these products are stored in the steamers and warehouses, how they are loaded and unloaded, how they are transshipped, etc. All this is in the realm of sense-perception and not imagination. They thus get *sense-perceptions*.

On returning to school they should revive all these percepts, giving as exact descriptions as possible. They should see again, hear again, and revive all the manifold experiences just as exactly as possible. This is *reproductive* imagination. To stimulate these revivals encourage oral discussions and written lessons, have them draw and remake in miniature some of the things they have observed. An abundance of time should be taken for it. Too often pupils observe much and never revive any of the experiences. In that way the benefits are largely lost, for without revival the idea soon becomes vague and hazy.

The third stage, that of *constructive* or *productive* imagination, should not be omitted. They may be asked to revise

and rearrange some of the things they observed. For example, ask if they could rearrange the docks and terminals so as to make loading and unloading handier. Could they suggest new appliances for handling the various commodities? Are the terminals large enough? Are they of the right construction? Should they be in another part of the city? Where should the railway terminals be? etc. Keep in mind continually that the constructive imagination as well as the reproductive is absolutely dependent upon previous sensory experiences. The essence of imagination does not consist in the rearrangement of materials, but in their revival in the form of images.

Another good problem for constructive imagination would be to ask the pupils to suggest ways for handling more advantageously the congested traffic on "Second Avenue." Ask them to landscape more artistically their school grounds, some particular city park, etc.

Everything possible should be done to secure objective illustration of as large a fund of facts as possible. Wherever practicable, things should be seen in their natural habitat, plants in the fields, rocks in the ledges, etc. Excursions should be of frequent occurrence in all public schools. The fresh air and exercise are themselves conducive to clear brains and vivid imaginations. Many city children have never seen common domestic farm animals such as the cow, pig, hen, and sheep. Their only ideas have been built up from pictures. Their ideas through this source are so erroneous that many children have thought the cow no larger than a mouse. The pictures were of the same size, why should they not so think? Excursions should include factories, foundries, flouring-mills, paper-mills, tanneries, printing-offices, brick-yards, stone-quarries, water-works, gas-works, electric-lighting plants, railroad depots, commission houses, museums, art-galleries, law-courts, legislative halls, caucuses, etc., the particular ones visited depending upon the locality. Not infrequently are classes taught about plants, soils, and minerals without a single objective illustration, not seldom do pupils "pass" in the subject of civil

government without ever having witnessed a single feature discussed. It is still words, words, words!

The school museum should also be a prominent feature of every school; in it should be found specimens of forest, field, factory, and trade from home surroundings, and as much as means will allow illustrating the life of other countries. Extended zoological, botanical, and mineralogical cabinets are not usually so educative for children as collections typifying the industrial and social life of people—remember that the people are to be the centre of interest. Children should be encouraged in their natural instincts for making collections. More geography has frequently been learned by a boy through his stamp collection—which his teachers and parents may have ridiculed and tried to destroy—than in all of his hours of formal toil at the subject. Of 229 boys, Doctor G. Stanley Hall found that only 19 had no collections. Thirty-two per cent of these had made collections from nature, and 34 per cent had made postage-stamp collections. The age at which the postage-stamp interest is at its height seems to be from 9 to 11 years of age—just the age when geography is one of the dominant school subjects.

In studying the geography of foreign countries we must make it concrete, even where not feasible to make it objective. The child should get many details, so that the concepts may be full of meaning. In order to secure fulness and concreteness, the text-book will have to be abandoned, or, at any rate, considered as a text, with the context to be supplied. Most books are altogether too condensed. Here is a sample description of the people of Holland as given in a recent geography: "The Dutch are an exceedingly thrifty, hard-working people. They succeed in raising good crops of rye, wheat, oats, and other farm produce, and they export cattle, sheep, butter, and cheese." The whole consideration of Holland occupies less than a page, one-fourth of that space being given to two pictures—the best part of the whole description for children. But with the necessary generality of the statement, what could remain in the child's mind except words?

In order to get a picture of Holland the pupils should see as many objects from there as are obtainable, and at least see pictures of many other things illustrative of Holland life. In this picture there must be definite imagery of the historic windmills, its "misty-moisty" climate, the sluggish rivers, flat land—so flat that from a certain tower in Utrecht almost the entire country can be seen; we must image the three great enemies of Holland, the lakes which they drain, the rivers which they imprison, and the great arch-enemy, the sea, which they combat, sometimes successfully, sometimes themselves overwhelmed; we must image the reclaimed acres and the dikes, which nobody has ever described perfectly in words; the alarm-bells; the stage-boats on the canals in summer, and the whole families, from grandsire to grandchildren, on skates in winter; the storks on the roofs, with the traditions which each little Hollander is told concerning these sacred birds; the Dutch fishing-boats, the awkward carts, the housewives scrubbing the floors; the wooden shoes with silver buckles, the short petticoats and gorgeous head-dresses; the delftware and the naturalistic paintings of Rembrandt, Van de Velde, and Ruysdael. These and scores of other objects and events must be brought before the pupil so vividly that he projects himself into the scene as an actual witness. This can be accomplished only by presenting many details and in a concrete way. It is only by this means that a proper conceptual idea can arise. To leave out of Dutch life the windmills, the dikes, the storks, and the habits of the people would be like teaching "Hamlet" with Hamlet left out. It is not impossible to teach all the above concretely, either by objects, pictures, or through verbal description which portrays the new scenes in terms of known experiences.

"Recently I went into a practice school connected with the University of Chicago," wrote President Faunce, "where I saw the children gathered round a teacher who was reading to them the poem of 'Hiawatha,' and their eyes were wide with wonder. Then they went over into the Field Columbian Museum and saw the materials of Indian life, the tents and

the wampum, the feathers and the moccasins, and all the utensils of the Indian household. Then they returned and modelled in clay an Indian village, with Hiawatha at one end of it, and all over it the marks of the creative imagination." In contrast President Faunce said: "I, too, learned 'Hiawatha,' side by side with Mr. Colburn's ingenuities. I could spell the name of every tree in Hiawatha's forest, but would not have known one of them if I had seen it. I could pronounce the name of every beast on the American continent or in Noah's ark, but knew nothing about any one of them."

Collections of pictures should form a part of the equipment of every geographical classroom. Such collections as are found in many magazines and accompanied by verbal description can be easily obtained, and they serve to awaken great interest and to make things real. Photographs can frequently be secured. The stereopticon views are still better. One only needs to watch the crowds going to the "magic-lantern" shows and the moving-picture shows to know the interest that is aroused by views projected upon the screen. Things appear to stand out in three-dimensional space, and perfect illusions might almost cause one to mistake the representations for the realities. No one ever obtained much of an idea of a glacier from an ordinary picture and verbal description. But I have seen stereopticon views that almost made one hear the detonation as immense blocks of ice fell into the sea. What complex scenes are we not able to portray vividly to the eye. One only lacks real auditory impressions, and they will be awakened through imaginative representations. Every schoolroom should at least be supplied with a good lantern, and it should be a part of every teacher's equipment to know how to operate it. The moving-picture machine is now so perfect that it is to be hoped the day is not distant when every school shall possess one.

These perceptual notions should more and more be enriched through the images reproduced from former perceptions. The words of the teacher and descriptive books should also bring often into requisition as large a stock of images as possible.

Finally, when a vast array of fundamental notions has been derived through the medium of sense experience, the representations may be stimulated entirely through verbal description. Thus, by the time a pupil is able to read standard literature, it ought to be no longer necessary to resort to objective or pictorial illustration to convey the pictures delineated by the writer. They ought to be called into being by their verbal symbols. But until the word has received a content based upon experience the word can call up no image. In this higher stage, which is of equal importance with the lower, new pictures are created through combination of the pictures suggested by the words.

If geography is taught according to the method suggested, it may become one of the richest subjects in the whole curriculum. It need no longer remain "the poor man's study," but one which is rich in basal concepts for almost every other subject. It furnishes most of the fundamental apperceptive content for the material sciences, and dealing as it does with life in all its relations, it furnishes the indispensable preliminary to the understanding of literature, history, commerce, economics, politics, and even education and religion.

All this, however, deals with sense-perceptions and only becomes imagination when revived. Definite opportunities for accurate recall should be provided. This will first use reproductive imagination. Then recombinations, modifications, and elaborations should be made through productive or constructive imagination. After the pupils have made observations, gaining definite and accurate sense-perceptions, they should be given an opportunity to revive those experiences as accurately as possible. They should give descriptions, being held to accurate statements of fact. At first they will tend to omit important data or to arrange them in unorganized fashion. Few persons without training observe accurately and report faithfully. Practice under sympathetic, critical guidance will accomplish wonders. It is so much easier to be uncritical that the average mind is exceedingly slovenly in reviewing former perceptions.

Imagination in Scientific Study.—"Physical investigation, more than anything else besides, helps to teach us the actual value and right use of the imagination," said Sir Benjamin Brodie in an address to the Royal Society. (Quoted by Tyndall, *Fragments of Science*, p. 417.) It is not only important as a means of training, but the sciences themselves could never be profitably pursued without a judicious use of the imagination. The same noted authority says that this power, when "properly controlled by experience and reflection, becomes the noblest attribute of man; the source of poetic genius, the instrument of discovery in science, without the aid of which Newton would never have invented fluxions, nor Davy have decomposed the earths and alkalies, nor would Columbus have found another continent."

It needs to be clearly understood that the repicturing of things exactly as they are is the essence of imagination. To look upon a plant and then when it is no longer present to recall its details of root, stem, branches, leaves, color, or shape, is to imagine. To observe a hydrostatic press and later recall the relations of the lever, piston, valves, bolts, and standards, is to exercise imagination. The student who looks through the microscope and sees unicellular beings, then turns away and draws them exactly is exercising imagination of the most accurate kind. To view the proper geometric figure in connection with the Pythagorean theorem, and then without having the book or paper present to see the figure and all its relations with the mind's eye, is to exercise imaginative processes no less than to write a book of fiction. In fact, the former is the more fundamental and the latter is apt to be incoherent, hazy, and inexact, unless a foundation has been laid through imagination of the former, exact reproductive type. Imagination is employed in acquiring and recalling the concrete details of science no less than in building up notions of relations and theories which have not been tested by observation of material things. Reproductive imagination is employed in the former case, productive or constructive in the latter. The former is prerequisite to the latter, a fact which is so often overlooked. If this exact reproduction of definite notions of

material things, gained through the senses of sight, sound, touch, taste, smell, and weight is insisted upon, the combinative imagination will almost take care of itself. At any rate, there is no place for the latter without definite images to combine. Thus the scientist with his exact consideration of material things has as much—I am inclined to think much more—to do with the development of powerful creative imaginations as the poet, the painter, or the sculptor.

For one with some genius in painting no better foundation for science could be had than an exact and exacting course in descriptive geometry as given in an engineering school. Doubtless all our great painters and sculptors owe much of their success in producing ideal creations to their exact knowledge of anatomy and architecture. These subjects are always prescribed in schools of art. A great architect must see every minutest detail, even in his most unique creations. It is said that Michaelangelo, before beginning to decorate a room in fresco, spent days and days studying intently the bare walls and picturing exactly what was to appear. Some one remonstrated with him for such a waste of time, but he said: "I have to see my picture before I can paint it." "With accurate experiment and observation to work upon, imagination becomes the architect of physical theory. Newton's passage from a falling apple to a falling moon was an act of the prepared imagination, without which the 'laws of Kepler' could never have been traced to their foundations. Out of the facts of chemistry the constructive imagination of Dalton formed the atomic theory." (Tyndall, *Fragments of Science*, p. 419.) In the study of sound the imagination must be called upon to transcend actual experience. "The bodily eye, for example, cannot see the condensations and rarefactions of the waves of sound. We construct them in thought, and we believe as firmly in their existence as in that of the air itself." (Tyndall, *op. cit.*, p. 421.) Then carry it over into the realm of light. In microscopic work only flat surfaces are seen—the imagination must build up the third dimension and the relations between the parts.

Just because natural science deals with objects perceived

by the senses it affords unsurpassed opportunities for imagination. As indicated, it need not be confined to exact copies of things perceived. It may be used to recombine in the most unheard-of ways. It may picture the most fantastic combinations and conceive of those elements as working according to laws before undreamed of. In fact, this is the course of science. It is not unscientific to do this provided we further do what the true scientist does, viz., test the conclusions. Barring the small part played by accident in discovery, this has been the course followed in the development of science. "First comes the conjecture pictured by the imagination, then logic and reasoning, then the test by observation and experiment. This is the necessary order of discovery, and it is the best order for the student who will follow in the footsteps of the discoverer. It is, and must be, the path of the discoverer. His mind must work pictorially." (Tyler, *School Review*, 6: 721–722.)

Imagination and Invention.—In every invention a result to be attained has to be pictured and then known appliances tested to see how far they will meet the requirements. If they fall short they must be varied and combined and recombined in such a way as to reach a result. The man who invented copper toes for shoes asked himself: "What will make that part of the shoe wear as long as the rest?" He set about imagining various things that would produce the result. Copper caps were finally hit upon and the inventor was made rich. The invention of the steam-engine was a similar process. What new motive can be used in exerting great force? was the question set. Steam had lifted the lid of the teakettle, and the imagination confined great amounts of steam in a cylinder, and then conceived a piston to compress the air, and the problem was solved. The imagination has discovered atoms and worlds; it has penetrated the interstices of all matter; it has encompassed in its glance the limits of the universe; it has espied the invisible force which unites all things terrestrial and celestial; it has stolen the secret laws of all the varying changes in the universe; it has enslaved these laws

and forces; it has joined them in infinitesimal permutations; it has harnessed the cosmic forces singly and tandem in n-fold forms and caused them to do service from the most menial to the most exalted; it has ploughed our fields and garnered the bounteous harvests; it has lighted our homes; it has clad us warmly and fed us bountifully; it has provided us æsthetic enjoyment, as in music, art, and poetry; it has girt the globe with means of transit; by its achievements knowledge of the thoughts and actions of all mankind is borne on lightning pulsations to every corner of the globe.

Imagination in the Study of Literature.—In training the imagination in literary study first see that the literature studied is imaginative, and then let it appeal to all the senses, so that literature may quicken the boy to say like Christopher Sly:

> "I see, I hear, I speak;
> I smell sweet savors, and I feel soft things."

Further, the laws of apperception must be heeded. It is absurd to expect the child to imagine when no elements are already in his possession. Parts of "Childe Harold," though beautiful verse, would awaken no representations in the mind of a reader unacquainted with Italian skies. Similarly "The Lady of the Lake" would call up very little visual imagery to a child not made acquainted, through personal observation or pictorial representation, with the Scottish mountains, lakes, and Highland costumes. What vague, distorted pictures must be evolved by children, lifelong residents in the slum districts of a metropolitan city like London or New York, and who have never made an excursion beyond their own ward, when they read the opening stanza of Gray's "Elegy":

> "The curfew tolls the knell of parting day,
> The lowing herd winds slowly o'er the lea,
> The ploughman homeward plods his weary way,
> And leaves the world to darkness and to me."

They have never beheld a herd, perhaps not even a cow; their only estimate is one gained from pictures, and undoubt-

edly many a boy has thus gained the idea that a cow and a mouse are of the same size. They have never seen a lea; perhaps have never set foot on earth—only on pavements. The picture of a fading, glimmering landscape is undreamed. Most of the imagery suggested in the first seven stanzas would be impossible to such children until they were provided with the necessary background of sensory experience. This leads us to the very practical question as to how the sense-perceptions may be supplied. It must be granted that it is not so easy to secure as to prescribe, but that in no wise vitiates the theory nor does it lessen the desirability nor the imperativeness of providing in every manner possible for a rich perceptual life. And whenever we cannot resort to nature we must resort to art to assist us. In many cases where words are entirely inadequate, and objective illustration impossible, pictures, diagrams, and charts can come to the rescue. Pictorial illustration, as an aid in teaching, was initiated by that noble and prophetic old Moravian John Ames Comenius nearly 300 years ago, but the manifold use of visual representation is only yet in its infancy. The stereopticon can be used as well in literature as in geography and physics. A good stereopticon ought to be a part of the equipment of every schoolroom, not one for every building, but one for every room, for every grade, and every teacher ought to be instructed in the technic of its manipulation. Take, for example, Irving's "Westminster Abbey," and combine the effect of lantern views with the verbal description given by Irving, and how much greater would be the effect than by the verbal description alone. In my own case the careful study of the verbal description failed to give me a picture at all corresponding to reality. Upon visiting the abbey I was not a little surprised to find how erroneous my notions were concerning it. A few lantern-slides would have changed my ideal entirely. It has been well said that the foreign traveller gets only as much history or geography through his travels as he takes with him. In attempting to train the imagination through literature we may learn a valuable lesson from a psy-

chological analysis of some of the best imaginative literature. We need to bear in mind that those images which are clearest and most vivid are the ones that are most easily described. Hence we know that those descriptions which are most accurate and convey the clearest pictures to the reader are descriptions of things which have come within the writer's actual experience. Scott, bred elsewhere, could never have delineated such masterpieces as "The Lady of the Lake," *Ivanhoe*, and "Marmion." Byron, without actual knowledge of Lake Geneva, Swiss mountains and castles, and the political vicissitudes of that country could never have penned the "Prisoner of Chillon." No other environment could have furnished the same images and stimulated him to describe them with the same realistic touches. "The Cotter's Saturday Night" could not have been written by one unpossessed of a lifelong familiarity with Scottish life. Irving, living in the Carolinas or California, could never have depicted the ideal Dutch life in old New York nor the "Legend of Sleepy Hollow." Though ideal and fictitious, they are true representations of what has been lived. No one but a Yankee bred could have written "When the frost is on the punkin," and only a child-lover and observer could have produced those sweet, inimitable poems given to us by Eugene Field. Halleck has studied the greatest bard of all the ages, Shakespeare, to determine the secret of his great imaginative resources. He has shown that Shakespeare's works are replete with allusions to nature. The images described are not confined to sight alone, but all the senses are appealed to—sight, hearing, touch, taste, and smell. Those scenes Shakespeare would never have been able to represent without first-hand knowledge of all the things he has depicted. The poet's early life was spent out of doors, in contact with the fields, the woods, the birds, and the animals. Though his parents could probably neither read nor write, the young Shakespeare received a splendid education; that is, through sensory training he obtained a vast store of images which were later woven into such marvellous combinations.

Imagination in Everyday Life.—While stress has been laid on the education of the imagination in connection with school subjects, it must not be inferred that imagination is of value in scholastic life only. No power of the mind should be more active in performing the duties outside of school, and the purpose of the school training is in part to make the individual more efficient and happier in the extra-school occupations throughout the rest of his life. The imagination is needed in every art, trade, craft, or occupation. For example, the efficient blacksmith must see exactly, in imagination, the horse's hoof to be shod, the wagon tire to be fitted, the function of the bolt or brace; and then he must hammer the iron and steel to fit the particular case. The painter, the carpenter, the architect, the watchmaker, the machinist, the inventor, the typewriter, the printer, the landscape-gardener, the tailor, the dressmaker, the milliner, the musician, the farmer—all need well-trained powers of imagination if they are to succeed in life.

Wonders of the Imagination.—In closing we may echo the statement of Robert Witt that "the possession of a vivid imagination, of the imaginative faculty in all its variety and many-sidedness, is a gift of the gods themselves, and, as it were, priceless. Imagination has the power to alter the face of the world, to bridge distance, to annihilate time; like an alchemist, it can transmute, refine, transform; like the artist, it is skilful to glorify and to enrich. On the moral side of life it knows how to comfort and encourage, to inspire and control, to animate and to rejoice." (*Westminster Review*, August, 1900.)

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. After looking at a drawing, try to reproduce it from memory. 2. Look at some simple object and try to draw it from memory. 3. Do not look at a watch-dial, but try to draw it. 4. What mistakes did you make? 5. Can you revive accurately images of members of your family? 6. Which can you image the more accurately, pictures of your friends or of photographs of them? Why? 7. Crook the finger as if pulling the trigger of a pistol; do not move a muscle, but think hard of the effort. Can you "feel" the movement and the strain? 8. Can you sometimes hear

things that are purely imaginary? 9. Is it of value to have pupils try to image things after the stimuli have been removed? 10. What are the steps to follow in causing pupils to use (*a*) reproductive and (*b*) constructive imagination in learning music, penmanship, drawing, a geography lesson on handling traffic in their city?

References for Further Reading

1. Bolton, *Principles of Education*, chaps. XVII, XVIII, XIX.
2. Cameron, *Psychology and the School*, chap. VI.
3. Colvin and Bagley, *Human Behavior*, chap. XV.
4. Colvin, *The Learning Process*, chaps. VII, VIII.
5. Norsworthy and Whitley, *Psychology of Childhood*, chap. IX.
6. Tanner, *The Child: His Thinking, Feeling, and Doing*, chap. VII.
7. Titchener, *A Primer of Psychology*, chap. X.
8. Woodworth, *Psychology: A Study of Mental Life*, chaps. XV, XIX.

CHAPTER XV

THINKING AND LEARNING TO THINK

Importance of the Question.—One question almost certain to be discussed in a teachers' meeting is "How can we get pupils to think?" Doctor Schaeffer once said: "You can't stop them from thinking!" If Schaeffer was right, then why the necessity of teaching pupils to think? The answer is that even though they are bound to think, they do not always think effectively, nor do they always think worth-while thoughts. Doubtless the second is the graver problem. No technical definition of thinking will be given here. The following simple definition will suffice: *Thinking is a process of comparing, deliberating, or weighing possibilities and coming to a decision.*

Independence in Thinking.—Independence in thinking is a rare but thoroughly economical mode of activity. Many people are so unused to thinking for themselves that they would be frightened at the appearance in consciousness of a thought really their own. It has been said that "animals think not at all, and some men a little." Most of the effective thinking of the world is carried on by a relatively small number of individuals. The rest of the world are mere echoists. This is a terribly wasteful process and sinful. There are hundreds of everyday illustrations which prove that many people do very little independent thinking. The majority of voters cast their ballot for the same party as their fathers belonged to, or allow themselves to be dictated to by a few political bosses. Multitudes of people regulate their conduct, their business, and their speech entirely by other people's thoughts. Their conclusions are all second-hand and give evidence of great mustiness. If one doubts the force of tradition, just let him try

to secure some reform in any direction he pleases. A new measure is at once regarded with suspicion simply because no one ever knew of that before. Every new idea proposed for the schools is at once branded by the masses as a "fad."

Millions of gallons of patent medicines containing alcohol and opiates as the chief ingredients are sold annually. Thousands of babies are stupefied by being dosed with "soothing syrups" containing opiates. It is no wonder that so many children grow up stupid. The "quiet" produced by the opiates sometimes persists through life. Hygienic rules which common sense should teach every one are ever being ignorantly disobeyed. The history of medicine is replete with illustrations of the influence of charms, incantations, and fetichisms. Even to-day the masses can be wheedled into absurd notions concerning medicinal values. Let some one announce a "vegetable remedy," or, still better, an "Indian vegetable remedy," or a "vegetable remedy discovered by a missionary or an Egyptian," and it at once has millions of throats open to receive it.

When Columbus asserted that the earth was spherical, people scouted the idea, and when he passed through the streets jeered at him as being an insane man. Had they not evidence through their own senses that disproved such a crazy theory as he proposed? A little later Galileo, Copernicus, and Bruno shocked the world by asserting that not the earth but the sun is the centre of the universe. They were not only scorned but Bruno was burned at the stake because he would not retract, and Galileo, after bitter persecution, was made to swear that he had never believed such blasphemous doctrines. Could the people not see with their own eyes? The sun rose every morning and set every night after travelling round the earth. Various conjectures were rife as to what it did during the darkened half of the day, but of course they were positive concerning its relation to the earth during the other hours. Could they not believe their own senses? And Aristotle had never mentioned such a preposterous proposition. Monroe writes (*The Educational Ideal*, p. 9) that "during this long

period . . . the dry formalism and dead conning of words . . . led, inevitably, to the dreary hootings of scholasticism. This owlish learning, growing more outrageous as its metaphysics became more absurdly deep, soon lost all point of contact with humanity. Its husks of syllogism drove all appetite for real learning from the mind of the student, and he contented himself, ignorant of better intellectual food, with a smattering of Latin, a jargon of philosophy."

Superstitions and signs have by no means all belonged to a bygone age. Why does the horseshoe hang over so many doors? Why do so many people hesitate to begin a journey or a new piece of work on Friday? Why do fewer steamships start Friday than any other day, if they can get plenty of passengers for Friday? Recently I met a man carrying a rattlesnake's tail in his hatband. On inquiry I found that he did this to ward off rheumatism! He firmly believed in the efficacy of the senseless process. Why do farmers plant their potatoes in the new of the moon and some other crops in the old of the moon? Why do they consult the almanac before slaughtering beef or weaning a lamb? This happens to be "ground-hog day," and thousands of people are pinning their faith in the remaining winter weather upon the supposed action of the innocent little creature. I recently heard a man say: "The winter has been so cold, we shall have an early spring." A little applied knowledge of the convertibility of heat into other forms of energy would teach that there is no necessary truth in his statement.

The School Should Train to Think.—The school can perform no higher function than to teach independence in thinking. Unfortunately, as many schools are conducted, everything tends to beget dependence. The child finds himself in a realm of mysterious, meaningless symbols, strange customs, arbitrary rules and regulations for his conduct, and is forthwith made to feel that all must be learned and accepted unquestioningly. As he progresses he finds words without significance which he must pronounce, read, and spell. Rules in arithmetic and grammar are forced upon him to be mechani-

cally memorized without illumination; long strings of dates, names of kings, queens, dynasties, battles, and generals must be recited and called history; names of capes, bays, rivers, and mountains, which have only location, must be committed. Most of this is without a glimmering of meaning or a particle of interest in the content on the part of the learner. The child early learns by imitation to accept the husks of knowledge and to produce the *certificates* for real knowledge when called on to recite. Instead of continuing in a questioning attitude he learns that the line of least resistance is to take everything ready-made. Dewey remarks that "what is primarily required is first-hand experience. Until recently the school has literally been dressed out with hand-me-down garments, with intellectual suits which other people have worn."

The school should train the pupil to think, and to think effectively. That is, it should free the child from superstition, it should train him to weigh authorities, not to accept things dogmatically. It should train him to form conclusions from given data. These conclusions should be just such, and only such, as are warranted by the facts in hand. Some people form no conclusions at all for themselves. They never dare assert opinions unless others bear them company. They are largely echoes of other people. Still others form opinions, but too hastily, the conclusions not being based upon evidence and unwarranted by the facts. Both these tendencies must be overcome. There is the child who repeats only what the book says, and again the child who is continually talking without thinking. Both of these classes may be helped by careful attention in requiring them to be reflective. One needs to be pushed into the water to be shown that he can swim, and the other needs to be restrained from jumping into the whirlpools.

Although it is the utmost pedantry to expect the child to be a discoverer or an inventor of knowledge, new and valuable to the world, yet he should be led through the established truths in the "course" in such a way that it shall possess interest, rationality, and meaning for him. Many truths he can and should be led purposively to discover by himself and

for himself—not for the world—and what you point out to him should be understood and full of interest. Of course in so doing he will not make independent discoveries. But you will have supplied the conditions which it may have taken the world ages to discover, and the child will now perceive the relations and the results. With all the rule-of-thumb exercises, the parrot memorizing, and the dogmatic statements which the child finds at school, it is little wonder that he forgets that he has ideas of his own when school questions are under consideration, even though he is ultraindependent on the diamond or the gridiron and among his fellows. Coleridge says: "To educate is to train to think, for by active thinking alone is knowledge attained. Without active thought we cannot get beyond mere belief, for to pass from belief to knowledge means to sift and weigh evidence for oneself. . . . Alas," he exclaims further, "how many examples are now present to my memory of young men the most anxiously and expensively be-school-mastered, be-tutored, be-lectured, anything but educated; who have received arms and ammunition, instead of skill, strength, and courage; varnished rather than polished; perilously overcivilized, and most pitiably uncultivated! And all from inattention to the method dictated by nature herself, to the simple truth, that as the forms in all organized existence, so must all true and living knowledge proceed from within; that it may be trained, supported, fed, excited, but can never be infused or impressed." (Quoted by Welton, *The Logical Bases of Education*, p. 252.)

Importance of the Concept or Universal Truth.—It has been well stated by McMurry that the concept is the goal of all instruction. This is true if we bear in mind as McMurry has done that there are moral truths as well as intellectual, and that all worthy truths should result in influencing action. Isolated percepts and detached facts are valuable only in so far as they form a nucleus or matrix out of which universal truths are evolved. Too much of teaching deals with unrelated facts and symbols of facts which do not lead to the production of instruments (the concepts) whereby new cases can

be dealt with. The solution of a particular example in arithmetic is of no value unless it leads to the formation of a rule whereby others of a similar nature may be analyzed and solved. A particular experiment in physics or chemistry may be interesting, but unless it illustrates some principle or law it is of no great value. No great progress in foreign languages, or in the mother tongue, for that matter, could be made did not the learner arrive (not necessarily consciously) at laws and principles which are of general application. Even the child that says "I *runned* down the hill" has arrived at several general principles, one of which at least has exceptions. However, his mistake arises out of his correct application of a law which he has learned.

Psychological Meaning of the Concept.—If conceptual thinking is so important in teaching, then it will be valuable for teachers to study carefully the meaning of the concept and the modes of promoting its formation. The concept differs from the percept in many important respects. The percept is particular, concrete, and in consciousness only when the object is present to the senses. A concrete and specific copy of the percept is an image. Percepts and images are ideas of individual things; are specific and concrete. The concept is an idea of a class. It deals with universals. The concepts of chair or house do not refer to particular chairs or houses, but to the classes of objects. When we think chair conceptually we are not concerned with a big chair or a little one, a dining-chair or a rocker, an oak chair or one of mahogany. When we have a concept of animal we do not think of a cat or a dog, a white animal or a black one, a ferocious one or a docile one. In all conceptual thinking the characteristics common to the class are included. As soon as we turn to some particular individual of the class we must think in terms of percepts or of images. The concept, however, cannot be imaged.

We must guard against the idea that a concept relates to material objects only, or even that it is always represented by a noun. There are just as truly concepts of actions or relations. The predicate, as well as the subject, in any sentence

expresses a conceptual idea. The same is true of every other element or part of speech. To understand the expression "The ink flows freely from my pen," it is just as necessary to understand the denotation and the connotation of "flows" as of ink or pen. Similarly the prepositional phrase "from my pen" can only be understood through the universal idea compounded from many individual ideas that were first known through experience. Laws in physics and chemistry, rules in arithmetic and algebra, definitions in grammar, are all expressions of conceptual ideas. They do not necessarily represent concepts in the child mind. If he has begun with the definitions, rules, and laws learned verbatim, they do not stand for clear, definite, enlarged relational ideas. They are mere words, the counters of realities and not the realities. But if elements connoted in the expressions have been experimentally known, their relations apprehended, and the whole knit together into a product which gives a new background for all subsequent experiences, then we may say that the concept has been experienced. In natural science the learner must through classification of ideas be continually forming new concepts, not only of objects but of their manifold relations. These concepts must be ever subject to modification and revision through new experiences.

Genetic View of the Concept.—It should be clearly understood that a concept is not a psychical product with a fixed value or content. When one gets a concept of a given object he has not exactly the same idea as some one else who has a concept designated by the same name. The child's idea of horse is, for example, very different from the one possessed by the farmer, the veterinarian, the jockey, or the zoologist. In fact, each of these will have different ideas included in the concept. The jockey has all the fine racing points of the horse in his idea, while the zoologist thinks of the place in the animal scale to which the horse belongs. A given concept also changes in the mind of the same individual according to his experiences. One's childhood concept of a given thing is very different from his concept of the same thing when

he becomes an adult. For example, a child is given a book containing pictures; he thereupon marks off that object from others and isolates it as a class. But as the years go by, if rightly schooled, he gradually enlarges his idea of book. He learns of the different bindings, different sizes, varying print, and, more important for the idea of book, he learns of the different types of books, judged by the contents. He finds that there are story-books, reading-books, arithmetics, grammars, histories, geographies, dictionaries, encyclopædias; books of fiction, travel, biography, and others in wonderful profusion. One's idea of book is never complete, but with the student ever enlarging.

How different the child's idea of carbon, when he has seen it exemplified only in a piece of coal, from the concept of the chemist who has studied it in its manifold relations. Every one thinks he has a perfect concept of "home." However, let one try to describe the homes of the Cingalese, the Kaffirs, the Comanches, the Hindoos, or a king, and see whether he will not acknowledge that there are multitudes of individual ideas that could still be incorporated into his concept, thereby extending it. Let the ordinary person try to describe his concept of oxygen (which word he would say he understood perfectly) and see how narrow his concept, and even how vague. One who has not studied chemistry can tell little about oxygen. One of my adult students said he understood the word, knew that the substance was a gas, that plants and animals need it to sustain life. There was the expression of a very crude concept; one of very narrow content; but it was nevertheless a concept. Another student who had studied chemistry a little added that it was a constituent of water, of nitric acid, of sulphuric acid, and a few other acids; that it was a colorless, tasteless gas, and a few other facts. This student had a little fuller and more exact notion or concept of the substance. Suppose I had called upon a professor of chemistry? What he could have told me would make a book. His concept is vastly fuller and also more exact.

The child's notion of plants is one thing, the botanist's an-

other; the child knows only a few facts, and those indefinitely; the botanist knows multitudes of them, and those with exactness. The child has formed a few accidental, mechanical associations; for example, that all plants have leaves and lose them in the fall; the botanist has formed myriads of thoughtful associations relating to structure, function, use, and habitat. The child's generalizations concerning people are at first few and largely the result of chance associations. As he grows older he extends his range of acquaintances, discovering different types, enlarging his range of observations, drawing newer conclusions, revising old ones, thus constantly modifying and enlarging his concept of mankind. Before he becomes a sociologist, a statesman, or a leader of men in any capacity, his crude childish notions of society must undergo such transformation that his specialized adult conceptions will no longer be recognizable as related to the primitive ones. However, this is the only process whereby the rich, accurate, and completer notions could have been developed. The rate of growth may be sometimes faster, sometimes slower, but the stages must be passed through. Finished concepts can never be borrowed ready-made. They must grow, and not merely by accretion of new material, but also by apperceptive integration.

Language and Thinking in Concepts.—There is a very close relation between accuracy of expression and accuracy of thinking. Much of the looseness of children's thinking may be traced to slovenliness of expression. The statement of a rule, law, or generalization wrought out by the student through the study of observed facts is a very important and clarifying exercise. Too often there is no attempt at the formulation of rules or principles by the pupils, but the rules are either not learned or they are taken ready-made and merely committed to memory. The old-fashioned rote-learning without comprehension of rules and definitions was bad, but some of the modern superficial exposure to masses of facts without attempt at analysis, organization, classification, or definition of them is not much better. The former closed the mind against inves-

tigation and produced the opinionated echoist, the latter produces the chaotic-minded, superficial factmonger. The facts are usually without coherence or logical relation. It is only when fundamental laws or principles are comprehended that knowledge becomes valid and serviceable.

Much more time ought to be spent in each subject in helping pupils to formulate in good language the generalizations worked out. Every teacher should be a language teacher, not to emphasize the formal side of language, but to assist pupils in clear thinking. Doubtless, if much less time were spent in isolated language study and much more in connection with easy study, the result would be much better. Geometry is very largely an exercise in terse expression of rather simple mathematical concepts. Definiteness of expression should be insisted upon.

The Statement of Concepts.—Although the importance of expression and language training has been emphasized, a caution needs to be suggested against the forcing of over-refined scientific statements before the concepts themselves have been acquired. It is easy to require children to memorize definitions and descriptions of things which they totally fail to comprehend. No definition should be committed to memory until its meaning is understood. A definition is a highly condensed statement of a concept. Since the expression of a concept is the final step in its acquisition, if memorized before understood it tends to close the mind against further analysis of the content. It therefore closes all avenues of acquisition for that particular idea. What is true of definitions is also true of rules.

It is a good thing to have summaries and outlines made—by the pupils themselves. If stereotyped summaries and outlines are learned, they tend, like definitions, to close the mind against further search for content and meaning. An outline presented at the beginning of a subject or topic should never be memorized at that stage. It may be presented as a sort of guide-board to indicate the direction to be followed, but it is detrimental if considered as the full expression of the con-

cepts themselves. The most valuable outlines and summaries are those made by the learners themselves. It is especially important that advanced students be required to organize the materials which they have acquired. Unless required to do so, they, like children, tend to depend upon verbal memory, and frequently deceive themselves and their instructors by the expression of knowledge which is vague and meaningless to them. Even though the summaries made by the learner himself may be less finished than those given by the instructor and memorized in form by the learner, they are far more valuable than those borrowed ready-made. The summaries made independently by the learner indicate what he knows—his concepts—while those memorized from another show what the teacher knows and the pupil is able to echo.

Scientific Classification and Organization of Knowledge.—Important as it is to have knowledge classified in an orderly and scientific manner, a caution should be observed against overemphasizing this with beginners. The child mind is not scientific in its tendencies. It is absorptive, acquisitive, but not orderly. The interest and the attention of the child are flitting, and undoubtedly this is necessary for normal growth. Too long-continued attention in any direction causes overtension and one-sidedness of growth, because of the great plasticity at that age. It is a great mistake to overemphasize system, classification, or refinement of expression in childhood. It is sure to kill interest, spontaneity, and self-activity, and to produce arrest of development in some direction or other. We must remember that one of the very causes of instability is the struggle of instinctive tendencies to assert themselves. While we are causing the child to fix absolutely certain forms and formulas, we are probably stifling the expression of many desirable instincts and making him lopsided in other directions. Any teacher who has tried to teach nature study to children from a book, logically and scientifically arranged from the adult point of view, has undoubtedly made a failure of it. Even in the grammar-school and the high school there is great danger of overemphasizing the

purely logical side of studies. There is too much anxiety to have everything systematized and ticketed when the pupil leaves a course at any point. What will be the harm if pupils do not "finish" a given "course" in history, geography, or physics? Who can say what "the course" should be in any one of them? In different countries, in different localities, every one of them may differ very materially in content. When a student studies history in college he certainly ought to organize the subject thoroughly, but before that time it is far more important that he gather facts and acquire a headway of interest.

We may go so far as to maintain that with beginners in any grade of school, and even in college, there is great danger of overemphasizing classification and systematization of knowledge. To classify and organize there must be something to classify and organize. The beginner in economics, chemistry, psychology, or the theory of education, for example, needs to go through a gathering period before devoting too much attention to systematization and organization, no less than does the child in the kindergarten. The genesis and growth of the concept demands it; and organization means relatively finished expression of concepts. Of course the teacher should proceed in an orderly, systematic manner, but it is fatal to spontaneous growth in the learner if he becomes too conscious of the method by which he is acquiring. He should be absorbingly interested in the ideas or activities acquired and relatively oblivious of the method of acquisition. Even the teacher must be guided much more by the psychological unfolding of his pupils' minds than by logical categories.

Effective Thinking through Habit.—It is important for the student to understand early the force and value of habit. Much time is lost by every one of us because our early training did not render automatic all those activities that we have to perform constantly and in the same way. Purely mechanical work can be controlled more economically by lower nervous centres than by higher. In childhood and youth the

nervous system is plastic, a prime condition for memorizing and fixing habits. Among the habits that should become ingrained during this period are those of correct bodily postures and activities, correct speech, the multiplication table, spelling, writing, those involved in learning to speak foreign languages. Most habits are controlled by the spinal cord, which is early developed. Hence we should form habits early, so that the brain may be relieved later of mechanical work and be concerned with higher operations. As Doctor Balliet has observed:

> At first a child uses his brain in walking; later he can walk from habit, and walks, therefore, with his spinal cord. At first we spell with painful consciousness; later we spell familiar words of our vocabulary with little or no consciousness. Children ought to be trained to write and spell mainly with the spinal cord, and to use their brain power in thinking the thoughts to be expressed. We do many things with the spinal cord to relieve the brain. We walk with the cord, we write and spell with the cord; I suppose we knit and gossip with the spinal cord; indeed, we may sing and pray, not with our hearts, nor with our brains, but with the upper part of our spinal cord. We tip our hats to each other, not with our brains, but mainly with our spinal cord; when we meet people whom we do not wish to see, we often shake hands mechanically with our spinal cord—hence we speak of a "cordial welcome."

Not only do these elementary physical activities become automatic, but also processes of judging and reasoning must become largely mechanical before becoming serviceable. One's thinking is largely specialized, and judgment outside of the well-beaten track of thinking is not very valuable. The lawyer's opinion concerning disease is slowly formed and unreliable; the doctor's judgment about legal matters likewise is valueless. The expert in a given line is one who has studied widely and who can form instantaneous judgments because of the habitual consideration of the data. Difficult studies pursued through a long time until mastery is complete become simple as the alphabet. Mathematicians become so familiar with the calculus that they may read it for recreation when fatigued with other work. The lawyer can instantly cite

scores of cases and precedents for which the tyro would have required hours to summon to the foreground of consciousness. Hence, when knowledge is to become usable it must be pondered long and every detail absolutely appropriated. To arrange work in such a way as to sustain interest through variety and at the same time dwell upon it until thoroughly comprehended and appropriated is high teaching art. The demands for variety frequently allure to new fields before assimilation has been effected.

I wonder if there is not much in modern student life that militates against the deepest thinking. With the multiplication of student activities, of themselves in no way secondary to any others in importance, have not the opportunities for sequestered contemplation decreased? With football, baseball, basket-ball, tennis, rowing, skating, the literary society, the dramatic club, the freshman banquet, the sophomore cotillion, the junior "prom," the senior "hop," the numberless fraternity, sorority, and various house-parties, the church, social, and other engagements, besides the loafing hour, the theatre, concert, special lectures galore, the newspapers and magazines to scan, the letters to write home and other places, applications for schools to make, one might exclaim: "And when do they find time to study?" In ancient times and in the Middle Ages the scholars shut themselves away from the world, quiet as it was, in order to avoid the distractions against thinking. While they erred in not recognizing that the senses are the source of all knowledge, were they not wise in recognizing that to think effectively demands solitude?

Many students take on altogether too many activities. In my own observation I have known several students who arrested their development badly by getting too many irons in the fire. A student's popularity is not infrequently the cause of his intellectual arrest. By attempting debates, athletics, dramatics, study, and society all at the same time, his energies are dissipated, his growth stunted, while his plodding companion, by everlastingly keeping at a few things, finally becomes a master and frequently astonishes even himself as well

as his acquaintances. Even short courses with too much variety, except for inspiration, are uneconomical because they do not lay permanent foundations. Too many open lecture courses provided by faculties may easily be distracting and a source of dissipation. The student must learn to say no to the siren's voice which continually beckons him to unrelated fields.

I sometimes feel that there ought to be some course labelled "thinking," in which the individual should be isolated from everybody long enough to empty his mind of all ideas which are merely echoes, and then to discern what are really his own. With all the distraction of congested social life, the time may come when it would be a blessing for the state to imprison a few great men each year and allow them only pen, ink, and paper. It may have been a fortunate thing for the world that John Bunyan languished in prison until his thoughts had time to germinate and come to full fruition. Possibly the blind Milton, shut away from the distractions of visual stimuli, may have looked within and discovered thoughts struggling for expression, but stifled with the ephemeral ideas of sense-perception.

While we are rightly emphasizing group activities as an aid in developing altruism, I wonder whether students do not sometimes misinterpret its meaning. Self-activity is fundamental in the process of acquisition of knowledge. No knowledge is of much value that is not made one's own personal possession. This means more than the recital of words and formulas gained from books and companions. In their desire to be helpful, I sometimes see students in groups, even sitting on the stairways where the crowds are passing, believing they are *studying* together. When one hears the bits of gossip interspersed between the formulas, the declensions, and historical dates, one wonders where the calm reflection, deep concentration, analysis, comparison, doubt, contemplation, deliberation, complete abstraction, enter in. An oversocial roommate who persists in retailing the gossip of the day during the hour set apart for study is an uneconomical acquisition. Psy-

chology has thoroughly demonstrated that we can consciously attend economically to only one set of ideas at a time. Even much note-taking in the class is an uneconomical distraction. The faithful but misguided student frequently attempts to take down every word uttered. He deceives himself, for what he hopes to carry under his arm he should have in his head. No wonder that sometimes the less scrupulous one who cuts class and borrows notes instead of writing them fares about as well.

In student life it is important to thoroughly master a task as speedily as possible. To skim over a lesson and leave it without mastery is wasteful. The process may be repeated a dozen times in this way and then be only half learned. Hence, "whatsoever thou findest to do, do it with all thy mind and with all thy heart and with all thy strength."

May I say a word on the ethics of cramming for examinations? The method is a delusion and a snare. Ideas are not grasped, associations are not made, brain tracks are not made permanent, and even though the student might pass an examination on such possessions, like the notes of an insolvent bank they are found to be worthless trash when put to real use. Instead of wisdom more to be prized than fine gold, such a process may leave one with only bogus certificates. Make your mental acquisitions absolutely your own while going over the subject day by day, take ten hours of sleep before every examination day, and the results need not be feared. In trying to gain possessions most economically and to make them most permanent, heed the following recipe: Study your lesson as if you expected to teach it. When you can teach it to some one else you possess it. Frequently actually try to teach your lesson. If your roommate will not submit, inflict it upon an imaginary pupil.

(See *The Popular Science Monthly*, vol. LXXI, September, 1907, where several of the preceding paragraphs were first published by the writer under the title "Some Ethical Aspects of Mental Economy.")

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Enumerate several false traditions now current. 2. Make a list of superstitions that are really heeded by otherwise intelligent persons. 3. Which do pupils usually prefer to do: memorize the text-book ideas or think out problems for themselves? Why? 4. What schoolroom procedures seem to stimulate pupils to think? What seem to train away from independent thinking? 5. In the laboratory work that you have observed in the high school has independent thinking been a dominant characteristic? 6. As ordinarily taught, does history encourage thinking? 7. Try to make out a set of thought-provoking questions on some phase of history, say, Washington's administration or Wilson's administration. (Be sure that the answers do not merely call for memorized statements.) 8. Do pupils who recite glibly in geometry necessarily reason carefully? 9. What are some of the causes of superficial reasoning in geometry? 10. Is it correct to say "slow but sure" with reference to efficiency in thinking? 11. Are slow readers better than rapid readers in comprehension of thought? 12. May the project method stimulate efficient thinking?

References for Further Reading

1. Bolton, *Principles of Education*, chaps. XX, XXII, XXIII.
2. Cameron, *Psychology and the School*, chaps. VII, VIII, IX.
3. Colvin, *The Learning Process*, chaps. XX, XXI, XXII.
4. Colvin and Bagley, *Human Behavior*, chap. XVIII.
5. Miller, *Directing Study*, chaps. III, VII.
6. Norsworthy and Whitley, *Psychology of Childhood*, chap. X.
7. Parker, *Methods of Teaching in High Schools*, chap. IX.
8. Pyle, *The Science of Human Nature*, chap. VIII.
9. Schaeffer, *Thinking and Learning to Think*. Entire book.
10. Thorndike, *Principles of Teaching*, chap. X.
11. Woodworth, *Psychology: A Study of Mental Life*, chap. XVIII.

CHAPTER XVI

INDUCTIVE AND DEDUCTIVE THINKING

Meaning of Induction.—All laws, rules, generalizations, or classifications have been discovered at some time by observing a number of individual cases. In much of our learning at the present time, especially in school, we accept ready-made the great majority of such laws or generalizations. But somebody had to work them out from individual cases. This process of discovery is termed induction. It may be defined as follows: *Induction is a process of thinking in which the learner discovers laws or generalizations from individual data.*

Examples of Induction.—Here is an apple-blossom with five petals. I examine several others, and finding the same number in each and that the arrangement is regular, I conclude that there are five petals on every apple-blossom. People saw a good many swans all of which were white, and the belief that all swans were white became firmly fixed. We now know, however, that there are black swans. But as long as only white swans had been seen, the former conclusion was a legitimate induction. For thousands of years people believed the earth to be flat and plate-shaped. They arrived at these conclusions just as we should do in case we had not been taught differently. We never noticed evidence of its sphericity, and from every point of view the line of meeting of the earth and sky seems to form a circle, and we seem to stand in the centre of the circular plane surface.

When the child first perceives things, they are experienced as isolated things without relationship or laws. Gradually as experiences multiply they seem to occur in regular orders and sequences, and connections seem to obtain among various things. These experiences gradually become classified and arranged according to laws apparent to the child. This is

precisely what occurs when the adult views new experiences. At first each occurrence is viewed singly, but as other phenomena occur they gradually become classified. The main difference here between the child and the adult is that the adult mind arrives at more general laws, which are more correct, and instead of mere chance associational bonds that assist in classification the adult seeks and finds more causal relations. However, the ordinary adult is far from being critical and accurate, and many generalizations are incorrect and even absurd. It is only the careful scientist who is able to make correct inductions. Even many of his conclusions are apt to be very imperfect and need continual revision. The true scientist is cautious about dogmatic assertions, and waits until sufficient evidence is collected before proclaiming his beliefs. Darwin, though believing in certain conclusions for a long time, was willing to collect materials and to observe for thirty years before publishing his conclusions to the world.

Imperfect Induction.—Oftentimes the generalizations derived through induction are incorrect. In fact, most conclusions so derived are at first guesses or hypotheses. This is true of the thinking of the savage or the scientist. The savage stops with the guess, the scientist keeps on guessing and verifying. Some farmers, for example, are sure that three white frosts bring a rain; that planting potatoes in the new of the moon brings bumper crops; that toads and earthworms rain down. The savage believes that spirits eat the food which is left in the forest for their propitiation; he resorts to charms, incantations, and sorcery in the cure of disease. All such conclusions are arrived at because of imperfect induction and lack of testing.

Children's Inductions.—Children do much more thinking than they are credited with. Much of their thinking has one characteristic of scientific thinking, viz., independence. Their judgments are apt to lack accuracy because they jump at conclusions before gaining sufficient data, and they do not try to verify them. Many of their conclusions, however, are better illustrations of genuine inductions than the echoings of

some older people. My boy of 4 said one cold day on reaching a park: "Let us hurry, for it will be cold here." I inquired why. "Because the trees make the wind blow," he replied. G., a girl of 5, brought me some elderberry-blossoms and asked: "What are these? What becomes of them?" She was told that they become fruit. "Then, do cherries have blossoms before the cherries grow?" she inquired. "Yes," I said. "Do apples have blossoms?" "Yes." "Do all fruits have flowers first?" Then came the statement: "There will be no berries if we pick off the flowers." Here we have a perfectly definite chain of induction, and the conclusion was independently drawn from the data at hand.

When the child says "I runned," "I singed," "I hurted myself," he is applying conclusions reached inductively. The course of reasoning is not a conscious process, but is just as unerring as if it were a matter of deliberate analysis and synthesis. Many misspellings are the result of reasoning based upon analogies. Certain values are learned for given letters, and the inference is drawn that the same values will always obtain. The misspelling is not the result of illogical reasoning, but quite the contrary. The following actual mistakes illustrate the point advanced: *meny*, *sed*, *peeple*, *mutch*, *eny*, *lern*, *axadent*, *suckseed*, *ashure*. To spell correctly many words of the English language one must be able to disregard logic and remember isolated combinations of sounds.

The child, like the savage, is anthropomorphic, and soon learns to ascribe very concrete causes to actions not visible and to forces not understood. For example, the wind is caused by some one waving a big fan; the rain comes down because some one has made holes in the sky; the lightning is caused by God lighting the gas quickly; thunder is the sound made by a wagon in the sky, or sometimes it is God groaning or walking on the floor. Children develop their own unique ideas on moral questions. They are quite certain to conclude that acts which are forbidden are wrong and that all not forbidden are perfectly right. Through our injudicious methods of correction they are apt to conclude that sin consists not in

the doing of certain things but in getting caught. Thus the "protective lie" comes to be resorted to and believed to be right. Children's inductions concerning the Deity, religion, time, the self, distance, are all very naïve, but strikingly independent of authority.

It is a sad commentary that when the child begins school he begins to surrender much of his independence of thinking. Being set to learning books instead of continuing with the world of objective reality, he soon learns to rely on authority instead of upon the evidence of his own senses. Again, his questionings are silenced by our methods and he ceases to be an alert inquirer while in school. The teacher frequently does all the interrogating and marks him down for wrong answers and for ignorance displayed by his questions. No wonder that he subconsciously arrives at the induction: "It pays to be silent and to expose as little ignorance as possible." Verbatim memory for the day comes to be the best-paying capital.

Illustrations of Inductive Exercises.—A few examples of the inductive development of certain generalizations will be given. Of course they are much abridged. The teacher might have to ask many more questions. The procedure is not independent discovery. The teacher selects the conditions and aims to get the pupils to draw valid conclusions. To accomplish even that means much and cannot fail to develop a new attitude toward study. The first illustration is from physics.

Take a tube which is nearly full of water and blow into it. A sound of a certain pitch is produced. Lengthen the tube by pouring out part of the water and a lower tone is produced. Pour out still more water, thereby lengthening the tube, and a still lower tone is produced. Reverse the order of procedure and note results. What may be concluded from this experiment? That the longer the tube the lower the tone; the shorter the tube the higher the tone.

The following illustrations will serve to show how the process of induction may be profitably employed in mathematics. Ordinarily the pupils are given a rule and then required to

work examples according to the rule. It is true they can learn the process and oftentimes work the examples just as accurately and speedily as if they had developed the rule inductively. But have they learned to think mathematically? The procedure is much like being asked to follow a cookbook recipe. The cake may turn out all right, but if something goes wrong intelligence has not been developed by which to correct the mistake.

I. *Aim.* To discover inductively the rule for pointing off the product in the multiplication of decimals.

II. Presuppose a knowledge of (1) multiplication of integral numbers, (2) reading and writing of decimals, (3) the reduction of common fractions to decimals, (4) the reduction of decimal fractions to common fractions.

III. Data and course of inductive reasoning:

1. Write for illustration the following examples:

   a. $3/10 \times 2/10 = 6/100$.
   b. $3/10 \times 5/10 = 15/100$.
   c. $5/100 \times 5/10 = 25/1000$.

2. Ask the pupils to rewrite, without performing the operations, the Examples *a*, *b*, *c* in decimal form, and they will give:

   a. $.3 \times .2 = ?$
   b. $.3 \times .5 = ?$
   c. $.05 \times .5 = ?$

3. Questions and answers:

   What was the product of $3/10 \times 2/10$? *Ans.:* $6/100$.
   Write the product in the form of a decimal. *Ans.:* .06.
   What, therefore, should be the product of $.3 \times .2$? *Ans.:* $6/100$ or .06.

   What was the product of $3/10 \times 5/10$? *Ans.:* $15/100$.
   Write the product as a decimal. *Ans.:* .15.
   What, therefore, should be the product of $.3 \times .5$? *Ans.:* $15/100$ or .15.

   What was the product of $5/100 \times 5/10$? *Ans.:* $25/1000$.
   Write the product as a decimal. *Ans.:* .025.
   What, therefore, should be the product of $.05 \times .5$? *Ans.:* $25/1000$ or .025.

How many decimal places in .3? *Ans.:* One.
How many decimal places in .2? *Ans.:* One.
How many decimal places in the product of $.3 \times .2$? *Ans.:* Two.

How many in the multiplicand in example *b*? *Ans.:* One.
How many in the multiplier? *Ans.:* One.
How many in the product? *Ans.:* Two.
How many in the multiplier, how many in the multiplicand, and how many in the product in Example *c*?

In Examples *a*, *b*, *c* compare the number of decimal places in both the multiplier and the multiplicand with those in the product. *Ans.:* There are as many in the product as in both multiplier and multiplicand taken together.

IV. Make a rule for pointing off the product in the multiplication of decimals. *Ans.:* Point off as many decimal places in the product as there are in both multiplicand and multiplier taken together.

The laws of decimal-fraction notation and numeration may be discovered and stated by pupils themselves. Presupposing that the decimal notation for integral numbers is understood, the following questions may be asked concerning the expression 11,111: What is the value of the second figure from the right as compared with the first 1? *Ans.:* Ten times as great. The third with the second? The fourth with the third, etc.? What is the name of each order? Now, how does the third figure from the right compare with the fourth? The second with the third? The first with the second? What would be the value of the next order to the right as compared with the first? *Ans.:* One-tenth. The next? *Ans.:* One-hundredth. What should be the name of each? Now we place a point between the whole number and the fraction to indicate the separation. How read 1? If I place a point to the left of it, what does it become? 11.1, how read? .1, how read? 11, how read?

The illustration on next page shows how the learner may arrive at the rule for finding (*a*) the area of a rectangle, and (*b*) the area of a triangle. Draw a rectangle, for example, one that represents a surface of $6' \times 4'$.

(*a*) Divide it into squares. How many squares in the upper row? *Ans.:* Six. How many in the next? *Ans.:* Six. How many in each row? How many rows of squares? *Ans.:* Four. Then if there are six squares in each of four rows, how many squares? *Ans.:* Twenty-four squares. State how you found this. *Ans.:* By multiplying six squares by four. What

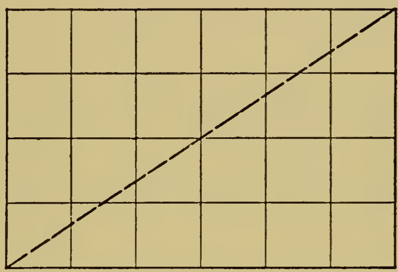


FIGURE USED IN DEVELOPING RULE FOR FINDING AREA OF RECTANGLE AND TRIANGLE

do each of the six squares represent? *Ans.:* A square foot. Then state the rule for finding the area of a rectangle. By this method it will be seen easily that we obtain square feet because we started with a square foot as the unit. Similarly the rule for finding the cubic contents of a rectangular solid can be developed. In fact, practically all of the rules in the mensuration of surfaces and solids can be thus built up.

(*b*) Draw a diagonal of the rectangle and ask: How do the two parts of the rectangle produced by drawing the diagonal compare in size? *Ans.:* It is manifest that they are equal. What part of the rectangle is each of the triangles? How does the base of each triangle compare with the length of the rectangle? *Ans.:* They are equal. How do the heights or altitudes of the triangle compare with the width of the rectangle? *Ans.:* They are equal. State again the rule for finding the area of a rectangle. Then, how shall we find the area of each triangle? State the rule for finding the area of any right triangle, when the base and altitude are given. This could be extended so as to hold for any triangle.

Examples from algebra are very easy to find. By actual division get the following results:

$a^2 - b^2 \div a - b = a + b$
$a^3 - b^3 \div a - b = a^2 + ab + b^2$
$a^4 - b^4 \div a - b = a^3 + a^2b + ab^2 + b^3$
$a^5 - b^5 \div a - b = a^4 + a^3b + a^2b^2 + ab^3 + b^4$
$a^{10} - b^{10} \div a - b = a^9 + a^8b + a^7b^2 + a^6b^3 + a^5b^4 + a^4b^5 + a^3b^6 + a^2b^7 + ab^8 + b^9$

What is the nature of the dividend? *Ans.:* The difference of like powers of the two numbers. The nature of the divisor? *Ans.:* The difference between the two numbers. Are all of the given dividends divisible by $a - b$? Do you think $a^{100} - b^{100}$ divisible by $a - b$? $a^x - b^x$ and $a^n - b^n$ by $a - b$? Do the last belong to the same class as the first? State what you believe to be true, *i. e.*, the *law* or *rule*. Proceed in a similar manner to develop the law of exponents, number of terms, etc., in the quotient.

As another illustration take the following (from *A School Algebra*, by C. A. Van Velzer and C. S. Slichter, p. 164):

What does $a^2a^2a^2$ equal? What then does $(a^2)^3$ equal?
What does $a^3a^3a^3$ equal? What then does $(a^3)^3$ equal?
What does $a^4a^4a^4$ equal? What then does $(x^4)^3$ equal?
What does $a^5a^5a^5$ equal? What then does $(a^5)^3$ equal?
What does $a^na^na^n$ equal? What then does $(a^n)^3$ equal?
What does $a^na^na^na^n$ equal? What then does $(a^n)^4$ equal?
What does the product of r factors each of which is a^n equal?
What does $(a^n)^r$ equal?

The rth power of the nth power of a number is equal to the nrth power of that number; this is expressed in the formula $(a^n)^r = a^{nr}$.

Order of Instruction.—The teacher, knowing that the inductive process is the natural order in which the mind moves, will arrange his instruction so as to further the habit and to assist in securing as a habit what is not very natural, viz., a critical evaluation of data. This does not mean that teachers

should never *tell* anything. To know when to tell, what to tell, and how to tell constitute high teaching art. But the order should be one of inductive unfoldment of ideas; a skilful marshalling of facts, propounding of questions, and leading the learner to draw conclusions for himself as far as possible. Reasoning either by induction or deduction means *deriving relational* knowledge. Merely gathering facts without establishing new relations among them is not reasoning at all.

Now notice that usually the rule is stated at the outset, the pupil told to learn it, and then given examples for practice. By that procedure he is not trained in reasoning but merely in *computing, according to rule.* Proof should come at some stage, but that is much harder. That is a deductive procedure. He should be trained to *think* and to work from principles rather than from rules.

Relation of the Text-Book to Induction.—Some have contended that text-books ought to give generalizations only; others that they ought to give the detailed facts but omit the generalizations and rules, leaving these to be worked out by pupils, with the teacher's help. In the first kind of book the particulars would need to be supplied by the teacher. This works fairly well in some subjects with skilful teachers. For example, an arithmetic on this plan would begin each case with the statement of the rule and then follow with examples and problems for application. All preliminary illustrative material would be omitted. Such a book in the hands of a poor teacher would be very uninteresting and difficult. Many of the text-books in the German schools are of this type. Even in geography there is the merest outline and a summary of generalizations. Geographies in this country have been of this type, but the newer ones furnish much material. The ones which furnish more material are manifestly more desirable than those which are merely boiled-down summaries. Only the teacher with an abundance of time and equipment can furnish the many details necessary. Even then the well-written text-book has the materials better selected and arranged than can be done for a particular class by most teachers.

A book of facts with the generalizations omitted is often to be found in our newer arithmetics. They are better than the book with only the generalizations. However, in unskilled hands they produce chaotic results. Knowledge needs classification and ticketing in order to be usable. The rules and generalizations fulfil the same functions as words. They help to isolate knowledge, to classify it, and to form a centre about which to group new related knowledge. A good text-book contains plenty of material. This material should be arranged in logical sequence, selected according to psychological needs, and in such a way that the learner who follows the discussion thoughtfully foresees the generalization before reaching it. The book statement of the generalization should, of course, be the best, and be calculated to clarify and enlarge the learner's notions. In many cases the teacher may go over the same lesson orally before assigning the text to be read. The book is then used to clarify and impress the knowledge more firmly. In other cases the pupils may safely be set to work out the lesson themselves. A book properly arranged meets their apperceptions and furnishes the data necessary for the development of every generalization. Every good text-book for older pupils should be so arranged that the learner could use it to good advantage without a teacher. With a teacher he should be able to use it to still better advantage.

But back of the text-book in most subjects there must be objective experiences gained at first hand. The understanding of the text-book is made possible only when it calls up personal observations and experiences. To be sure, the new whole need not have been experienced, but the elements composing the new whole must have been. In the material sciences laboratory experiments and demonstrations should make clear each step whenever possible. From the very nature of mind it is necessary that the elementary notions in all subjects should be built up objectively.

Importance and Use of Inductive Methods.—What will the pupil gain by being required to form conclusions for himself? In some cases results would be secured more quickly by simply

giving the rule and requiring him to apply it. For example, the rule for pointing off in multiplication of decimals can be committed to memory easily and its application learned without understanding a shadow of the reason therefor. The pupil could quickly learn to perform the operation without mistakes and undoubtedly would remember it as long as if acquired in a more laborious manner. Then what is gained by the more laborious process? Nothing, provided computation is the only end in view. But if arithmetic is to be "a study which trains the reasoning powers," the pupil must use it as a means of reasoning. To learn "that he must invert the terms of the divisor and multiply" is a mere act of memory and involves no real thinking, but to know why he does involves thinking to a high degree. We wish to inculcate *habits* of inductive reasoning.

Every successful man is a good inductive reasoner. The professor in science has no monopoly on induction. The business man has equal need of forming independent conclusions from everyday data. The merchant, the banker, any financier must watch daily factors that are liable to affect the markets, and from these factors they must draw conclusions as to the course of procedure. No rule can be laid down that will guide infallibly, for exactly the same factors never enter into combination twice. Hence each set of factors should lead to independent conclusions. Since the mind works according to habits acquired, it is of the highest importance to give the mind in early life as strong a tendency as possible toward inductive thinking.

The dry-goods merchant, to be successful, has to determine carefully in advance what kind of goods to purchase for the coming season. He must be guided by the experiences of past seasons and by the present conditions of trade, and by all the factors that affect trade. The past season will tell him whether woollen or cotton goods sold best, and what grade, and the quantity. The present condition of the money market will enable him to *guess* how freely people will spend their money; local conditions, as taxes and philanthropic enterprises, will

enable him to guess how much money will be diverted into other channels and how much may be left to purchase from him. He must consider the growth of the population of his trade district, also the number of competing merchants who have moved into or away from his neighborhood; and Dame Fashion must be consulted for changes of styles. Besides these, a host of other factors enter most intimately into the trade relations to affect the amount and quality of the stock to be purchased. The merchant who can look ahead, foresee advantages and disadvantages, is the successful one. That is, the one who makes the widest, most careful inductions is generally the most prosperous. It often takes a year or years to prove the truth or falsity of the generalizations which he makes, and the bits of evidence collected in testing his theories are made the basis of new generalizations.

The United States Weather Bureau makes its daily forecasts from the data relating to barometric and thermometric readings, wind velocities at different points, and the various changes in temperature, atmospheric pressure and humidity. The forecasts are applied inductive conclusions asserting probable conditions. The judge on the bench or the jury listening to a trial has problems of induction to deal with. The testimony of witnesses is to form the basis for generalizations, or, in other words, it contains the individual notions used in forming the general notions. Similarly in every occupation there is opportunity and necessity for arriving at new conclusions through the consideration of particular cases. True, in many cases the mind cannot isolate the data as clearly nor draw as definite conclusions as in mathematical problems. But even in the most "offhand" guess the mind subconsciously generalizes from data which have been gathered previously. Even our unexplainable prejudices are results of induction.

Therefore, how important that the pupil be trained in the careful collection of evidence and in weighing it accurately instead of jumping at conclusions! The person who habitually decides things too hastily and then spends his time re-

gretting his conclusions, reasons inductively no less than the one who arrives at a safe conclusion, but the induction of the former is imperfect.

Pupils, as well as scientists, should be taught to form hypotheses to account for certain phenomena. Hypotheses are guesses, but good guesses based upon a thorough knowledge of the conditions entering into the problem. The hypothesis should be (1) conceivable in the light of the facts; (2) it should be in accord with the facts; (3) it should explain the known facts; and (4) should be of such a character that inductions can be made from it. When hypotheses have stood the fire of criticism and have become well established they are termed theories. The atomic theory and the nebular theory were simply hypotheses or guesses which seemed to account for certain phenomena or relationships that existed, and from these guesses much actual progress in further knowledge has been made possible. The theory of a universal ether was at first propounded as an hypothesis attempting to explain some problems concerning the passage of light and heat rays. There were certain apparently demonstrated facts demanding explanation. The hypothesis which was put forth presented astounding difficulties of conception, but it has proved so valuable in working out practical applications, and its proof has been apparently so incontrovertible that it has long been a well-accepted theory. Even now, however, new hypotheses and theories looking toward the explanation of many of the phenomena of heat and light are being propounded.

The Deductive Method.—In deduction a law, rule, hypothesis, or generalization is the starting-point in thinking. Some one has previously worked out the conclusion from particular cases. The problem now is to take the conclusion and (*a*) apply it to particular cases, or (*b*) test its validity, or (*c*) discover new particular facts. As illustrations of the first type take the classical example: All men are mortal; Socrates was a man; therefore Socrates was mortal. Or, nouns are name words; John is a name; therefore the word John is a noun. In "parsing" in grammar the definitions of the vari-

ous parts of speech and their modifications are given and the pupil measures or compares the given words with the definitions. Similarly in classifying specimens in botany the pupil is given definitions of various species and families of plants. He then takes the particular specimen and studies the calyx, corolla, stamens, pistils, petals, stem, roots, etc., observes their characteristics, says: "They do not belong to the crowfoot family, but do correspond to the definition of the rose family." He has in effect reasoned thus: "The rose family has such and such characteristics. This plant has these characteristics. Therefore it belongs to the rose family." The best illustration of deduction in school subjects is found in the ordinary text-book in geometry. A theorem is stated which is assumed to be correct. For example: "The sum of the three angles of a triangle is equal to two right angles." The pupil has not discovered the principle. Some one else has, and the pupil's task is to test its truth or falsity. Only occasionally is a new fact discovered deductively. Deduction may be formally defined as follows: *Deduction is a process of thinking in which the learner starts with laws, principles, or hypotheses and applies them to individual cases; or tests their validity; or discovers new individual facts by means of them.*

The following are illustrations of deductive teaching. The first relates to a well-known principle of algebra. The book from which it was taken (Olney's *Complete Algebra*) starts the discussion with a statement of the principle. In many books the principle is first derived inductively. Most texts do not attempt to test or prove that it is true. The given book proves it and then gives examples in which the quotients are to be stated without actually dividing. Both the proof and the applications are deductive in character.

Proposition.—The difference between any two quantities is a divisor of the difference between the same powers of the quantities. *Demonstration.*—Let x and y be any two quantities and n any positive integer. First, $x - y$ divides $x^n - y^n$. Second, if n is even, $x + y$ divides $x^n - y^n$. Third, if n is odd, $x + y$ divides $x^n + y^n$.

First

$$
\begin{array}{l}
x - y\,)\,x^n - y^n \qquad (x^{n-1} + x^{n-2}y + x^{n-3}y^2 + x^{n-4}y^3 + \text{etc.} \\
\underline{x^n - x^{n-1}y} \\
\qquad x^{n-1}y - y^n \\
\qquad \underline{x^{n-1}y - x^{n-2}y^2} \\
\qquad\qquad x^{n-2}y^2 - y^n \\
\qquad\qquad \underline{x^{n-2}y^2 - x^{n-3}y^3} \\
\qquad\qquad\qquad x^{n-3}y^3 - y^n \\
\qquad\qquad\qquad \underline{x^{n-3}y^3 - x^{n-4}y^4} \\
\qquad\qquad\qquad\qquad x^{n-4}y^4 - y^n
\end{array}
$$

Taking the first case, we proceed in form with the division, till enough terms to determine the law are found. We find that each remainder consists of two terms, the second of which, $-y^n$, is the second term of the dividend constantly brought down unchanged; and the first contains x with an exponent decreasing by unity in each successive remainder, and y with an exponent *increasing* at the same rate that the exponent of x *decreases*. At this rate the exponent of x in the nth remainder becomes O, and that of y, n. Hence the nth remainder is $y^n - y^n$, or O; and the division is exact. Q. E. D.

The following is a typical deductive statement found in a high-school text in physics (Black and Davis, *Practical Physics*, p. 78). Note that the principle is stated first and then a demonstration is given. At the close of the chapter a number of problems and exercises are given, applying the various principles studied and demonstrated in the chapter.

Air is very compressible. In one respect gases are very different from liquids, namely, in compressibility. This striking difference can be shown in the following experiment:

When a brass tube, with a closely fitting steel rod, is filled with air, the steel plunger can be easily pushed down by hand, and when the plunger is released, it springs back nearly to its initial position. If it does not come quite back to its initial position, it means that some of the air has leaked out. The entrapped air acts like a spring. But when the tube is filled with water, or any other liquid, it is quite impossible to push the plunger down, to any perceptible extent, by hand, and when the end of the plunger is struck with a hammer, the effect is as if the entire tube were a solid steel column, because the liquid is so nearly incompressible.

High-school geometry furnishes the best possibilities for the use of the deductive method. The learner starts with the theorem and is asked to prove the truth or falsity of it. If he works it out for himself, he reasons deductively. If he memorizes the printed discussion, he follows a deductive method, but he does not necessarily reason. The fact that the discussions are fully written out in most text-books on geometry militates against securing the most efficient work in reasoning. The plan of the book fosters pure verbal memorizing. If only a few hints were given, much better thinking would be stimulated. The "original exercises" are usually the best part of the book, but too often omitted.

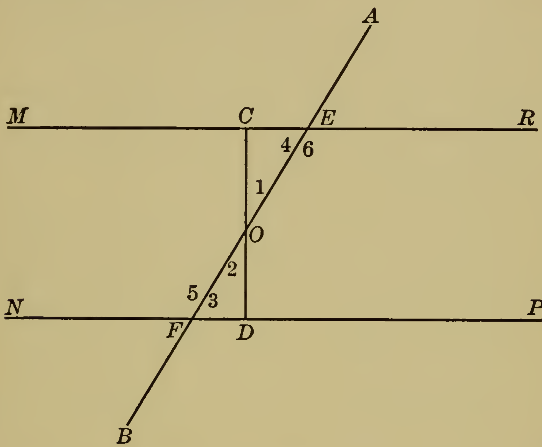
Although deductive methods are more easily apparent in geometry than in other subjects, yet they are being employed continually. Whenever definitions, laws, and principles are stated and then tested, or when applications are made of the laws and principles the deductive method is used. Grammar has most usually been taught by this method. Latin and Greek are quite universally taught deductively. In American schools the modern foreign languages have generally been taught by the translation method, which is deductive in its approach. The pupil learns his definitions and rules, and then applies them to the particular words. Algebra and arithmetic have been taught more deductively than inductively, but even more as a matter of memory and by rule-of-thumb methods. They are both excellent instruments for utilizing reasoning processes, but when rules are followed blindly, reasoning is used only meagrely.

It is very important that pupils learn to test results which they reach inductively, or which are furnished them ready-made. It is only by verification that the learner should come to a feeling of certainty and security in his own inductive conclusions. He should also learn to weigh, test, and verify statements furnished him by his teachers and his books. There is no certainty that when a pupil has reproduced correctly a demonstration in geometry which he has been set to learn, that he has really gone through a process of deduction.

He may have approached it deductively and learned the forms, but real deduction means reasoning, in which the individual derives the conclusions for himself. To follow another's de-

PROPOSITION XXI

III. Theorem. If two parallel lines are cut by a transversal, the alternate interior angles are equal.



Let $M R$ and $N P$ represent two parallel lines cut by the transversal $A B$.

Case I. To prove that the alternate interior angles 4 and 3 are equal.

Suggestion 1. Through O, the middle point of $E F$, draw $C D \perp$ to $N P$.

2. What relation does $C D$ sustain to $M R$? Why?

3. Compare $\triangle$s $O F D$ and $O E C$. Give auth.

4. Then, how do $\angle$s 4 and 3 compare? Why? Par. 84.

Case II. To prove that the alternate interior angles 6 and 5 are equal.

Suggestion 1. $\angle 4 + \angle 6 = \angle 5 + \angle 3$. Why?

2. Compare $\angle$s 6 and 5.

Therefore—

ductive discussion is not to reason deductively; it is not necessarily reasoning at all.

The above is a splendid illustration of the real use of the deductive method, in which the learner is required to do the thinking and not merely echo some one else who has thought

out all of the relations and conclusions. Notice especially how no conclusion except the theorem is stated. All the rest is left for the pupil to derive. (Taken from Shutts, *Plane and Solid Geometry*, pp. 46–47.)

Laboratory and Field Work.—It is frequently assumed that all science teaching by the laboratory method is inductive and efficient. As a matter of fact, it is frequently neither inductive nor efficient. When pupils are given a laboratory manual of minute instructions, provided with every piece of equipment, and then record mechanically what they do, and are not questioned concerning reasons and relations, they are apt to do very little thinking. It is as bad as the old-time textbook method without any laboratory.

In European schools pupils have very little individual laboratory manipulation in physics or chemistry. The teacher gives demonstration exercises, and questions the pupils sharply concerning the experiments. They get better results than in our schools, where pupils are turned loose in the laboratory and follow the "cook-book recipe" method. The abolishment of the laboratory is not here advocated. It should be emphasized, however, that the only purpose of the laboratory is to cause pupils to really think. Laboratory work should be largely inductive in order that pupils may learn to be discoverers, at least in a small way, but many laboratory exercises should be given for the purpose of demonstrating laws or principles, testing hypotheses or applying what has already been established as true.

Neither induction nor deduction should be followed exclusively in any subject. The foundations should always be laid inductively. Induction is a method of discovery, of investigation; deduction a method of testing, of proof, of application. After principles, laws, hypotheses, conclusions have been derived through a personal examination of particulars they should be carefully tested and proven either valid or incorrect. It is a mistake to teach sciences by inductive methods alone. Induction without deduction tends to lead learners to jump to conclusions. They develop a commenda-

ble habit of making independent observations, but the observations are apt to be loose and inaccurate. When deductive methods only are employed, the learner is apt to become absorbed in the abstractions of logic, too much inclined to reason out conclusions from insufficient data, too ready to rely on authority. The Middle Age scholasticism was characterized by the excessive use of deductive methods and a meagreness of investigation. The reasoning was correct and fine-spun, but often based on unsound premises. The combined use of both methods characterizes all good teaching and all effective study. In advanced classes the deductive approach often seems to characterize the most of the work, while in reality the approach is also inductive because the students have formerly gathered so many individual ideas that they need but to form or perfect their generalizations from the individual data. This is true in such subjects as economics, institutional history, and psychology.

It is necessary that we accept, at least tentatively, many laws and principles that have been discovered by scientists and others throughout the ages. It would be impossible, for lack of time if for no other reason, to test every working principle. Generally, also, the discovery of the law has required special scientific knowledge or equipment which we do not possess and therefore we could not test it. We must therefore learn to evaluate authorities, so that when it is impossible to test laws we may be reasonably sure that we are following probably correct principles and rules. Only by accepting and applying apparently valid knowledge vouched for by specialists are we able to make any progress. We all have to rely upon specialists. Few can test scientifically the principles of law, medicine, engineering, plumbing, accounting, or astronomy. In attempting to cause pupils to think critically we sometimes try to make pupils discover or prove every fact which they consider. That is manifestly impossible. They must learn to select and appropriate from the world's great storehouses of well-established facts. Of course, in learning to rely upon authorities they must be sufficiently critical not

to accept facts blindly simply because of the rank of the authorities.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Think of some generalization derived independently by children. 2. Recall some generalizations derived independently by yourself in connection with (*a*) some school subject, (*b*) some practical affairs of life. 3. Suppose a pupil performs an experiment and independently comes to a wrong conclusion. Is the time and effort wasted? 4. What subjects lend themselves to the inductive method of learning? 5. Under what circumstances should definitions in school subjects be memorized? 6. Arrange a lesson in your major subject to be taught by the inductive method. 7. Suggest a list of questions designed to help pupils to discover the function of an adjective. 8. Would you try to teach history inductively? 9. Were you taught arithmetic inductively or deductively? Which method do you consider preferable? 10. If a subject is not taught inductively, is it therefore taught deductively? 11. Should rules for spelling be taught inductively, deductively, or not at all? 12. Which phase of deduction, *discovery*, *proof*, or *application*, is most frequently employed by pupils? By persons in everyday life? 13. Under what circumstances is deduction used by pupils in laboratory exercises? Legitimate?

References for Further Reading

1. Bagley, *The Educative Process*, chaps. XIX, XX.
2. Bolton, *Principles of Education*, chap. XXIV.
3. Cameron, *Psychology and the School*, chap. VIII.
4. Colvin, *Introduction to High School Teaching*, chap. XIII.
5. Colvin, *The Learning Process*, chap. XXI.
6. McMurry, *Method of the Recitation*. Entire book.
7. Strayer, *A Brief Course in the Teaching Process*, chaps. V, VI.
8. Thorndike, *Principles of Teaching*, chap. X.

CHAPTER XVII

THE DIRECTION OF BEHAVIOR

The Dynamic Side of Life.—Deeds, not ideas or words, count. What determines one's course of action at any given moment? Professor Royce speaks of *will* as the direction of conduct. We have noted that sensations and ideas tend to develop into action. Which response will follow? Why do we select or choose one mode of behavior rather than another? It is just this selecting, choosing, following that constitutes what is known as will, or volition.

Ordinarily will is thought of as something which compels us to follow some line of action rather than another. It is said, for example: "He kept up by sheer force of his strong will," "His iron will carried him onward," "His will weakened," or "He failed because he lacked will." One person is said to have a firm will and another one that is changeable. Will is thus regarded as a sort of psychological ghost that continually pursues us, compelling or prohibiting whatever we do. Each one is supposed to be born with a will of a given type which remains with him through life. This is not true, however, because the will develops with experience. It is connected with intellectual and emotional states, and its growth is largely determined by them.

Royce said that our minds are full of "passing impulses, of tendencies to action, of passions, and of concerns for what we take to be our welfare. All these impulses and concerns get woven, by the laws of habit, into systems of ruling motives which express themselves without in our regular fashions of conduct. The whole of our inner life, viewed in this aspect, appears as the *purposive side of our consciousness, or as the will in the wider sense.*" (Royce, *Outlines of Psychology*, p. 367.)

Development of Will in the Child.—Instead of being a fixed quantity, the will of the child grows through experience. At the outset the child possesses through heredity a stock of motor impulses. Many of them are random, while others are quite definite. Then through being carried about, being fed, washed, and dressed, thousands of positions are assumed. Thus many movements, accidental so far as the child is concerned, are experienced. Each one of these is of definite value in trying a new movement, as they can be recombined in countless ways. Trial and error and trial and success are the usual ways of developing definite voluntary actions.

In order to understand fully developed volitional acts let us examine the genesis of a voluntary act; for example, throwing at a mark. We throw at the mark and do not succeed. But in doing so we have gained certain experiences—muscular, auditory, and others. Each of these experiences leaves a memory. It may be a visual memory of the appearance of the mark and of the distance, or it may be the kinesthetic memory of the position of the arm when it was raised, as the missile was hurled, of the position of the hand and the fingers as the missile was released. All of these memories are taken account of in gauging the next trial. We know, for example, how wide of the mark we came and how much muscular tension was exerted, at what height the object was released. These memories we compare with our ideas of the amount of force that ought to be exerted, the modified positions to be taken by the arm and hand, and other conditions which we think ought to bring about the desired end. We try again and possibly err in the opposite direction. The memories of this experience are now compared with the former ones and also with the imagined necessary ones, and we repeat the trial, attempting to correct all the former errors. If perchance we have accidentally hit the mark the first time, the case is fundamentally the same. In either case we try to remember the sensations and perceptions gained under these conditions and then endeavor to repeat them. It takes many trials before we can perform the action purposively, because our memories

of the movement are so fleeting and imperfect, and our ideas of what is necessary are so indefinite. At first we cannot know just what to do, because we can have no accurate idea of the end until we have actually accomplished the end.

From this analysis we see that in order to perform an act voluntarily we must have (*a*) an idea (not necessarily a conscious idea) of the end to be accomplished, and (*b*) a stock of memories of former experiences from which a suitable selection can be used in guiding action toward the ideal end. This idea of the end to be accomplished includes not only an idea of what is to be done, but also the idea of how to do it. On first consideration this may seem a startling statement. The inquiry will at once be raised as to how we can ever perform an act voluntarily if we must first know definitely how to accomplish the act and if that knowledge can only be gained by actual performance of it. Paradoxical as it may seem, however, no act can be performed voluntarily until it has been first performed non-voluntarily. This does not mean that as a whole it must have been performed non-voluntarily, but that the elements which enter into it must have been performed non-voluntarily. In the case of reaching for a book, for example, we do it at once without difficulty, although we have never reached for the identical book or in that particular place. But we have moved the arm and the hand in countless directions previously, and each of these reachings has been recorded in memory. When we reach for a particular book in a particular place we select from all the past experiences certain elements and combine those elements into a new whole and perform the new action with ease.

James writes that "no creature not endowed with divinatory power can perform an act voluntarily for the first time." But as we are not endowed with prophetic power we must wait for the movements to be performed involuntarily before we can frame ideas of what they are. "We learn all our possibilities by the way of experience. When a particular movement, having once occurred in a random, reflex, or involuntary way, has left an image of itself in the memory, then the

movement can be desired again, proposed as an end, and deliberately willed. But it is impossible to see how it could be willed before. *A supply of ideas of the various movements that are possible left in the memory by experiences of their involuntary performance is thus the first prerequisite of the voluntary life.*" (James, *Principles of Psychology*, II, pp. 487, 488.)

Professor Royce voices the same idea in the following sentences:

> Strange as the statement may seem, *we can never consciously and directly will any really novel course of action. We can directly will an act only when we have before done that act, and have so experienced the nature of it.* The will is as dependent as the intellect upon our past experience. One can indeed will an act which is sure to involve, in a given environment, absolutely novel consequences; but the act itself, so far as one wills it, is a familiar act. Thus a suicide can will an act which results in his own death, and so far he seems to be willing something which wholly transcends his past experience. But, as a fact, the act itself which he makes the direct object of his will (*e. g.*, pointing a pistol and pulling a trigger, or swallowing a dose) is itself an act with which he is long since decidedly familiar. (*Op. cit.*, p. 369.)

Relation of Habit and Will.—It is thus recognized that the basis of will is habit. The more that conduct becomes woven into organized systems the greater the ease and control of the behavior. What is accomplished easily and with control is done voluntarily. Ordinarily we think of habit as the outcome of will, but, as a matter of fact, few habits are initiated intentionally—voluntarily. The actions are launched through ideomotor action determined by chance environment, continued through imitation, and finally become habits. These determine our behavior.

What Is a Strong Will?—According to the popular notion that person has a strong will who is full of strong, uncontrolled impulses, who exhibits great vigor in doing things in the face of opposition, or who is able to resist great temptations. Our examination of the development of voluntary movements and the relation between volition and habit will not bear out the popular notion. The subject is so difficult, however, that a

little closer examination is necessary for full understanding. A voluntary action is one that is under control. It is one which has been brought under control by the individual or it may be in part due to hereditary tendencies. Yet we say of the man who experienced a great temptation to go into the saloon, who had a tremendous struggle with himself against going, but who finally mastered his inclination, that he had a strong will. Another man goes by the saloon door with no temptation, no inclination to go in, and without any struggle. We give him no credit for strength of will. We demand that there be struggle in order to ascribe anything to strength of will. The man who goes about with no temptation to pick people's pockets, no craving for murder, no longing to set a match under his neighbor's house, no struggle against evil, is not thought of as strong-willed. But let a man struggle with debasing impulses, come out victorious, and we cite him as a man of will. Now, this is incorrect. We may laud the man who has struggled and won as a means of encouragement to future righteousness, but it is wrong to regard him as an exemplar of sturdy will. A strong will in the psychological sense means a trained will; it means a high degree of control; while the very fact that a struggle with temptation has ensued indicates difficulty of control, or lack of will. The temptation and the struggle are indications of disease of will or lack of perfect volitional development. The power to go by the saloon, to keep one's hands out of people's pockets, to inhibit thoughts of revenge and injury to others is a token of a high degree of will-training. These virtues do not come merely through individual training, but they indicate hereditary tendencies accumulated through generations of training in temperate living, abstinence from excesses, self-renunciation, and altruism. Hence, the person with desirable hereditary endowment and properly developed individual habits does not feel temptation toward intemperate sense gratification, taking what does not belong to him, or destruction of another's property.

Most people would grant that I am *voluntarily* writing these

words, but how many there are who would not admit that such action exhibits considerable will-power. Should I walk across the floor or open my mouth and speak several sentences correctly, few would deny that it was voluntarily done, but how many would fail to acknowledge that it was an exhibition of strength of will. Because of the looseness of popular psychological analysis and the inaccuracies in the use of language, the word *willingly* has not been generally thought to express an attitude of *will*. But in reality one who is willing in doing a thing wills to do it. Should I be stricken with palsy and then tremblingly write a page, or stammer out a few incoherent sentences, or walk with tottering steps across the floor, but exhibit struggle and persistence, the same ones who conceded nothing to my will before would now marvel at my strength of will. As I regard the case, the palsied nerves, the exhausting struggle, and the indifferent execution are all signs of diseased and therefore weak will. The perfect control without struggle and accurate execution are evidences of strength of will in that direction. Whatever is voluntarily done and with ease and accuracy is a manifestation of a strong will.

Individual Variations in Volition.—It will be noted readily that there are a great many varieties of volitional response manifested by different individuals. There is the person who is cool, calm, calculating, and deliberate in everything he does; as his opposite there is the one who always acts on momentary impulses, never foreseeing completely the results of his action. Among the former type, represented admirably by Gladstone, are the great constructive statesmen; in the latter class we find many great reformers and soldiers—such men as Luther and Napoleon (the world-shaking type, as James denominates them). Then there is the vacillating type, thoroughly deliberating and weighing, but never arriving at a decision. Such a one is always "going to do" something, but never getting started. Extremes of this type, of course, are pathological.

It should also be noted that the same person may have strength of will in one direction and not in another. A high-

wayman may give an exhibition of the most perfect control in a railway hold-up, but he may be the most weak-kneed coward imaginable in facing a drawing-room full of company, in making a speech, or standing firm in a moral issue. Stammering is a disease of the will, and who has not seen otherwise strong men who have been stammerers? The stammering was indicative of weakness in a single direction. One may have perfect physical control but be lacking in intellectual control, *i. e.*, he may be subject to mind wandering, lacking in attention, in control of memory, imagination, or thinking. One may have good control of predominantly intellectual processes, but be without proper emotional balance. He may be a slave to some great absorbing passions or he may be subject to explosions of temper. Similarly there are those who have perfect control of intellectual and emotional processes but who are sadly lacking in moral control. It is important in education to recognize these variations that may appear in the same individual. If the moral will is weak, for example, it is frequently impossible to develop it through purely intellectual activities. Logical training will not necessarily produce honesty.

Will Means Accumulated Tendencies.—I have tried throughout this work to indicate that every experience leaves its ineffaceable trace upon the nervous system and, consequently, upon the mind. As these effects of experience accumulate in certain directions, impulses and tendencies toward action are produced in those directions. In this way the mind and body develop particular attitudes and processes. When we analyze the meaning of character we find that it implies nothing more nor less than the accumulated tendencies toward action in particular directions. A man who has habitually acted in a righteous direction has built up tendencies toward righteousness. On the other hand, one who has sown a generous supply of wild oats in youth is sure to reap in old age an abundant harvest of viciousness. It could not be otherwise. We are enjoined in the Scriptures that "whatsoever a man soweth, that shall he also reap." It may seem

somewhat materialistic to call these results of experience character, but from a scientific analysis of the effect of experience upon the nervous system and upon the mind, we cannot help but conclude that character is a result of all the experiences which have come to us. It is somewhat annoying to the one who has led an idle, dissolute life to contemplate that the record of all his life is constantly in evidence, impelling him in the direction in which he has started, but the result is unavoidable. On the other hand, one may derive a large measure of comfort and satisfaction from a knowledge of the scientific fact that lifelong experience in the direction of right will produce a fund of capital upon which we are continually to draw. A man who has thus lived properly all his life will be able to stand firm easily when the storm of temptation rages around him.

Transfer of Effects.—The discussion of formal discipline has shown that power gained in one direction does not give power in any other direction wholly unrelated. This is very true in connection with will-training because it has been so generally assumed that will-power can be applied to all situations equally well. The one who gains control in football has not thereby gained control in public speaking. Neither has the one who has acquired poise and perfect control of body, train of thoughts, and of voice thereby gained control in football. Each type of control must be gained by experience in doing that type of thing. Of course in so far as one experience may become an element in another experience it reinforces the other.

Directions of Control.—Among the manifold directions of controlled actions only a few may be discussed, and these merely in a suggestive rather than an exhaustive manner. First and fundamentally, every child must acquire muscular control of a great variety of actions, and in some cases of exceeding complexity. What are creeping, walking, standing, running, feeding oneself, going through the process of dressing, but cases of voluntary control? True, they come to seem automatic, but they are directly subject to modification and

control and, therefore, volitional. To stand well, possess an erect carriage, walk gracefully, or to manage one's hands and feet without awkwardness, are no mean accomplishments. They often secure for one an entrée to the best society and even add to one's monthly salary. To give assurance of possessing these qualities is a prime indorsement to a candidate for many positions. They must be learned, too, contrary to current opinion. They are a badge of good society, and indicate that the possessor of these habits has been under approved tutors, unconsciously observed it may be but none the less important. To manage one's voice so as to utter words distinctly, without stammering or hesitation, to modulate the voice properly in talking and singing, to be able to marshal apt words readily, to have the power of speaking in different languages, all these are excellent cases of a high degree of control. Who will say that they are not voluntary? Still there is no great degree of control until they are largely habitual. These are all worthy directions of will-training. Proficiency in any of the several directions indicates education of the highest importance, and gained only through much practice. Not only are the foregoing examples of muscular co-ordination and control, but they also illustrate controlled, highly complex psychical activities. Such activities as are manifested in drawing, painting, sculpture, watchmaking, the fine touch and execution in surgery, or playing the piano or violin, are all splendid illustrations of a high degree of co-ordination and control.

It is highly important that children receive thorough muscular training. This training in voluntary motor ability should be begun in infancy. The child must be allowed to move about freely. We have by no means reached the acme of perfection in the matter of suitable clothing for babies. At the outset we put them in dresses long enough to suit a nineteenth-century ballroom belle. Instead of being able to kick about vigorously, they are hampered in their movements by the unhygienic clothing. When the child becomes old enough to creep, he is often prevented by the mother, who

fears he will soil a pretty dress. He is thus deprived of lung development, chest expansion, control of hands, arms, and feet, and, in fact, the entire body is deprived of normal development. One child studied, who had been deprived of the pleasure and profit of creeping, was put into "jumper overalls" and allowed to creep. He gained two inches in chest expansion in eleven days! Besides the improvements in vital capacity and increased chest measurement, the child who creeps gains wonderfully in motor control. In his peregrinations he reaches for things, closes his chubby fists upon them, pulls himself toward things, making numberless daily motor adjustments requiring the fine calculation of conditions and the co-ordination of muscular effort. Again when the child loses his provinciality and becomes a pedestrian, fashion steps in to forbid his wearing clothes in which he may sample sand-piles and mud pies, in which he may climb fences and trees, turn somersaults, or roll in the grass. When shall we learn that the child must have freedom in order to develop properly physically, mentally, and morally?

The games and plays of childhood not only develop muscular control—the elemental type of will—but through them the child also learns to direct thoughts to definite ends and to control his feelings, both through subordination and in proper assertion. Plays and games have not been sufficiently utilized as educative means. Their value has been demonstrated in kindergartens and in schools for the feeble-minded, and we should take a hint for the education of normal children. I hope the time will come when every teacher in our public schools will be required to be on the playground during certain specific times as a director of the play activities of the children.

Intellectual Control.—Although the foregoing activities involve controlled psychical processes, there are still higher mental activities which are not so closely related to muscular actions. What one thinks about when not engaged in set routine duties seems at first sight to be accidental and uncontrolled, but an examination will reveal that our thoughts lie

along certain quite well-defined paths. We are constantly thinking about our line of work or pleasure, and, though temporary deviations are made because of chance suggestions, we continually revert to the habitual line of thought. It is precisely because the ideas are habitual that they are intruded before us. If we conscientiously set ourselves to reflecting upon a given topic, the degree of habituation in that direction determines the degree of readiness with which we stick to the purpose. In other words, the more we know in a given line, the more we have thought about it, the greater the degree of thought-control we can manifest in that line. If I am able to secure willing attention from my class, it is because the ideas which I am trying to get before them are so closely related to what they already know. If asked why they paid such close attention they would say because they were interested. This is only another way of saying that the road is a familiar one, that their apperception enables them to understand and follow without apparent effort what is discussed. Attention, even the most consciously voluntary, depends upon points of relation between the thing attended to and the experience of the learner. No one can voluntarily attend for any length of time to a mere spot on the wall. It is meaningless and without interest. As soon as the mind finds no well-worn tracks to follow, interest dies out, attention wavers, and control of thoughts is lost. The highest degree of volition is evidenced by long-continued application to a single purpose. The development of a great industry in pursuance of chosen ideals, the unremitting toil necessitated in writing books or in patiently conducting experimental researches, the persistence often manifested in acquiring a college education unaided and in the face of obstacles, each exemplifies a superlative exhibition of protracted volitional control. The momentary control of anger under provocation, individual acts of bravery or self-denial, or the careful attention to a single lesson are not to be compared with the thoroughly established, consistent conduct, regulated in a thousand ways and all promoting a single end. The former actions represent merely

temporary impulse, while the last-named represents integrity and fixity of high moral character.

Some people frequently notice that they do not seem to keep their attention easily upon a given train of thought. They are subject to mind-wandering. They should be assured that this is largely because they have never developed habits of reflecting long and continuously about anything. The habit of looking at all sides of a subject can be developed by persistent practice. Frequently the mind wanders because no fund of knowledge has been acquired along the line of pursuit. Furthermore, the most willing attention, *i. e.*, the most voluntary attention, is a direct outgrowth of interest. Genuine interest can only be developed through previous knowledge.

A characteristic of children is that they live in the present and for the present. Ask a child which he would prefer, a stick of candy to-day or ten sticks to-morrow, and he will invariably choose the one to-day. Likewise the savage is largely unmindful of the future. He provides for the present meal and then sleeps until hunger sends him on the chase to provide another. Civilization teaches men to deal in futures, to provide for the morrow, the rainy day, to provide a protracted course of education for the child as a preparation for the future. To teach the child to build for the future, to practise virtues and inhibit vices in order to eventually acquire ideal habits and states, and to insure the highest prudential control, is true pedagogy. The world's great thinkers have all been men who have been able to give sustained, undivided, and continuous thought to whatever occupied their attention.

Emotional Control.—To develop control of the feelings and emotions is an important direction of will-culture. When we consider that feelings and emotions are the great determining forces in active life, and that no progress was ever made that did not have back of it a great interest, the importance of the question is impressed upon us. Our attitude toward life and its duties determines what our active relations will be. Are we happy, cheerful, full of sympathy and kindly fellow feel-

ing; or are we sorrowful, depressed, full of anger, jealousy, or resentment? The answer indicates the direction which our actions will take. Hence we see the importance in a child's education of teaching control of the emotions. In the early life of the infant, and to a considerable extent through childhood, the feelings are more dominant than the intellect. The majority of all free activities of the lower animals and of children are impelled by feeling. Hunger and its satisfaction, the use of the muscles in free play, and satisfaction of curiosity are pre-eminently matters of feeling.

Practically all the early manifested instincts are emotional. Among these are fear, anger, jealousy, shyness, sociability, affection, and curiosity. The whole natural psychical provision for self-preservation is largely a matter of instinctive personal feeling. Rational intellectual processes scarcely enter into primitive modes of self-preservation. The newly hatched partridge is terrorized by strange objects, it knows not why; the kitten spits at a dog simply because it possesses an antipathy against it, not because it has individually concluded that such a course is best.

The child must acquire control of the various emotions to the end that they may become his ally instead of his enemy. In the earliest days control of such low feelings as hunger through the habits of regular eating are installed. The regulation of this feeling is of lifelong importance to every individual. Undoubtedly lack of control caused by irregular hours of eating, gormandizing in response to sense-feelings and improper food, have led in later life to intemperance in many other forms. Intemperance in eating, drinking, smoking, drug-using, etc., usually result from pampered, unregulated appetites.

The impulse to anger is early evinced. While contending for the high moral value of trained, intelligent anger, as evidenced by voting against chicanery and evil, yet we should teach that childish passion must be curbed. The infant straightens out, becomes tense, clutches its fists, screams, and abandons itself wholly to the feelings, partly because of satis-

faction, partly because of anger or fear. Not only are no habits of self-control thus initiated, but positive habits of giving way to anger are developed. The man who gives way to anger, who becomes dominated by animal manifestations, is always at a disadvantage with an adversary who keeps his head, who uses anger only to stimulate righteous action. Two general conditions must be observed in developing control of anger: first, the child must be removed as far as possible from irritating causes; second, correlatively, he must be kept as good-tempered as possible. One attempt at forming habits of good nature is worth ten efforts at reforming habits of ill nature. Good health, proper hygiene, and sunny-tempered parents, teachers, and companions go far toward insuring even-tempered children; while a child who is forced to live with crotchety, moody, and cranky parents and associates easily becomes inoculated with touchiness, irritability, and flightiness.

Because of the effect of assuming the outward expression of emotions in producing or increasing the emotion, it is highly valuable to the child to refrain from outbursts of temper, from giving way to foolish fears, or even to silly, causeless giggling. The conscious attempt to preserve a proper demeanor has a salutary effect in producing habits of emotional control. The hysterical, flighty woman, ready to go into spasms on hearing of a worm, a bug, or a fire, who throws a whole company into a panic in a time of excitement, is the one who was never taught to exercise proper self-restraint as a child. The cool, "heady" individual who averts panics, calms the crowd at a fire, or goes tranquilly into battle is the one who has schooled himself from childhood against such impulsive outbursts of emotion. The freedom of the moment has been bought by lifelong discipline.

Supreme wisdom is needed for developing well-regulated, healthful sex feelings. They are among the most deep-seated and far-reaching. Through the maintenance of perfect health, the restriction of food and appetites, proper exercise, healthy interests which monopolize the mental life, by giving plenty of physical work and wise companionship, sex feelings should

become irradiated into the higher emotions connected with home-building, social interests, and altruism in general. Just how to secure this ideal is not easy to prescribe. It is worthy of the wisdom of the sages. Thus far the primer of the subject has not been formulated.

Motor-Culture and Moral Culture.—Doctor G. Stanley Hall, in his incomparable article on moral education and will-training, points out the immense rôle motor-training has occupied in will growth. He believes that city children of to-day are liable to deteriorate volitionally, largely because they do not have opportunity for will-culture through motor-culture. By contrast he pictures the opportunities for such culture afforded by conditions of life a generation or two ago. In those days "most schoolboys had either farm work, chores, errands, jobs self-imposed or required by less tender parents; they *made* things, either toys or tools, out of school. Most schoolgirls did housework, more or less of which is, like farm work, perhaps the most varied and salutary as well as most venerable of all schools for the youthful body and mind. They undertook extensive works of embroidery, bed-quilting, knitting, sewing, mending, if not cleaning, and even spinning and weaving their own or others' clothing, and cared for the younger children. The wealthier devised or imposed tasks for will-culture, . . . as part of their education. Ten days at the hoe-handle, axe, or pitchfork, said an eminent educator lately in substance, with no new impression from without, and one constant and only duty, is a schooling in perseverance and sustained effort such as few boys now get in any shape." (*Pedagogical Seminary*, 2: 73–74.)

Children should be taught to work. A child that has not learned to work has not mastered the A B C's of will-training. Work differs from play in that it is not a means of relaxation. Work often demands that activity be kept up long after exhilaration has ceased. An object must be accomplished no matter what the inclinations may dictate.

Will and Deliberation.—Although it has been strongly argued that the voluntary execution of an act is largely conditioned upon the fund of allied habits which have been built

up, yet it should be noted that the highest acts of will involve conscious deliberation. While it has been strongly urged that the surest way of developing strength of will in a given direction is to early inculcate habits in that direction, yet this should not be taken to mean that one is to become an automaton. It does not imply that the child should not become a reflective being. He should most certainly be early accustomed to reflecting upon his conduct. A feeling of responsibility for sound judgment and righteous action should early become characteristics of one's life. It is a perverted and pernicious doctrine of interest and will which assumes that youth are irresponsible beings who may be excused for every deviation from the path of rectitude on the ground that they are only youth. The doctrine is sometimes carried so far as to exonerate even university students for committing things which would land other adults in the penitentiary. Though college education should and does prolong the period of infancy or plasticity, yet all training has been misdirected if it has not developed a habit of serious reflection upon every important step to be taken. It should not produce vacillation and hesitation, but rather sound judgment made rapid by the acquired habit of always reflecting and marshalling all sides of a question. Individual duty and responsibility are among the highest lessons to be learned, and the most difficult.

Habit, Will, and Character.—A trained will means a controlled mind and body, an organism that responds to the behests of conscience. This ideal condition can only be secured through oft-repeated actions in the desired direction. Every action performed by a child, whether initiated by himself or under compulsion, leaves a tendency to a repetition of the same action. Of course any process self-initiated is more potent by far than one performed under compulsion. Hence the importance of securing deliberate righteous action on the part of the child. But right conduct, even though compulsory, is better for the child's future than wrong conduct selected by the child. Every righteous action contributes to the fund of future capital which constitutes real character.

What one does in a controlled manner when off his guard reveals one's real character. To be sure, most of us masquerade a great deal and do many things that are put on for the occasion. These may give us reputation, but they are not parts of real character. It is related by Schaeffer that the Pennsylvania German gives vent to his feelings in profanity in his own native dialect. To show further how control is only secured through habitual reactions he adds that "as soon as he says his prayers he reverts to the language of the pulpit and of Luther's Bible, because he there finds the words which express the deepest wants and emotions of the human soul." (*Thinking and Learning to Think*, p. 93.)

Educational Significance.—This conception of the will, which is just beginning to be recognized, is of great importance pedagogically. Under the old way of conceiving the will as an entity of predetermined character, it was certainly useless to try to cultivate it, though, paradoxically, the same writers who promulgated the older theories of will and freedom of the will discoursed upon the great possibilities of will development. According to the view that will always implies conscious choice and deliberation, there could be no training in volitional activities until there had been developed a high degree of intellectual and affective life. There could be little, if any, manifestation of will in animals, and none in children until some months old. There would certainly be no use trying to train the will of a small babe, for children are many months old before they deliberately choose and execute. The same criticism applies here as to all of that psychology in which every psychosis was viewed from the standpoint of adult consciousness. The more recent psychology considers everything genetically and finds a rich heritage in the hereditary accumulations and in the subconscious life of both babyhood and of normal adult life. There is a rich mine of experience gained before the dawning of consciousness which must be explored, and which makes up a worthy portion of all our tendencies. We have learned through the study of memory and instinct that every impression leaves its inefface-

able trace. Thus every infantile kick and howl and tumble become significant for the larger development of voluntary life. We have seen that we will with all that we have willed. To will in absolutely novel directions is as impossible as lifting oneself by the boot-straps. The execution of every movement becomes significant. Hence it becomes important to regulate this congeries of random movements producing orderly paths of execution. Thus when we train the child to eat regularly, to sleep at definite times and quietly, when we promote digestion, when we care for its physical health and keep its motor apparatus in working order, we are helping him to lay the desirable foundations of his voluntary life.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Distinguish between habit and will. 2. Explain the place of habit in the development of will. 3. Analyze the process of learning to write and show how voluntary control is developed. 4. Point out the relation between muscular training and the development of will. 5. What is the popular meaning of will? How does it differ from the scientific? 6. Trace fully the development of volition in sticking to one's tasks. 7. Point out the relation between *willing* and *willingly*. 8. Relation between interest and the development of the will. 9. Meaning of *free will* (*a*) in the popular sense, (*b*) in a scientific sense. 10. Relation between will and morality. 11. Are all moral acts volitional? 12. Are the highest acts of volition necessarily moral? 13. To what extent is will a matter of heredity?

References for Further Reading

1. Bagley, *The Educative Process*, chaps. VII, VIII, IX.
2. Bolton, *Principles of Education*, chap. XXVII.
3. Cameron, *Psychology and the School*, chap. XI.
4. Colvin, *The Learning Process*, chaps. III, IV.
5. Colvin and Bagley, *Human Behavior*, chaps. IV, VII, XI.
6. O'Shea, *Mental Development and Education*, chaps. VII, VIII, IX.
7. Royce, *Outlines of Psychology*, chap. XV.
8. Woodworth, *Psychology: A Study of Mental Life*, chap. XX.

CHAPTER XVIII

THE TRANSFER OF TRAINING

Supposed Effects of Training.—Oftentimes the question is raised as to why certain subjects or facts should be learned by the child when they seem to have no utilitarian value. Very frequently the answer is: "They train and strengthen the mind." When I entered the university I heard the president say in an opening address: "When I was in college I studied trigonometry and calculus, but I have forgotten everything I learned, but the power still abides and I can use it in other relations." It is assumed that the training in arithmetic, grammar, etc., will strengthen the mind for all other subjects and for all of life's duties. Just how is not understood, but there has been and is a very firm belief that mental gymnastics of one type strengthen the mind in every direction. *This belief that training of one power, function, or structure will develop other powers, functions, or structures is known as the theory of "formal discipline," "general discipline," "transfer of training," or "generalized experience."*

It is held that the effects of training are general, and that whatever is gained in a given direction can be utilized in all other situations in life. The strength and skill derived through pitching hay, swinging Indian clubs, and rowing can be used in skating, swimming, constructing watches, or in resisting fatigue when under strain in professional duties. Analogous reasonings are followed out concerning mental growth and exercise. Each subject is assumed to be a sort of mental grindstone upon which the wits are to be sharpened. We are told that the study of arithmetic and grammar will develop strength of mind—a sort of mental muscle—which can be drawn upon in any emergency. The one who is strong in arithmetic, it is assumed, will be equally proficient in geom-

etry, botany, and foreign languages. The traditional subject for strengthening the reasoning powers is arithmetic.

The first real scientific challenge came from Professor James in his classical experiment in memory. James concluded from that experiment that training memory in a given direction had no effect upon memory for other things. Since that time hundreds of other experiments have been performed, most of them pointing in the same direction. The essential features of all the experiments are as follows:

1. Test a given ability *before training* on something entirely different.
2. Practise upon something entirely different long enough to improve in doing that.
3. Return to the original activity and test ability in that *after practice* upon something entirely different. (Do not exercise in the first direction.)
4. Compare the results of *before* and *after* practice in steps 1 and 3.

The best and most exhaustive experimental work in this line has been done under the direction of Doctor Thorndike at Columbia University. Thorndike and Woodworth made a great variety of experiments to discover the influence of training in estimating weights, distances, and areas upon other subsequent forms of learning. In Thorndike's own words (*Educational Psychology*, p. 90 *et seq.*):

Individuals practised estimating the areas of rectangles from 10 to 100 sq. cm. in size until a very marked improvement was attained. The improvement in accuracy for areas of the same size but of different shape due to this training was only 44 per cent as great as that for areas of the same shape and size. For areas of the same shape but from 140 to 300 sq. cm. in size the improvement was 30 per cent as great. For areas of different shape and from 140 to 400 sq. cm. in size the improvement was 52 per cent as great.

Training in estimating weights of from 40 to 120 grammes resulted in only 39 per cent as much improvement in estimating weights from 120 to 1,800 grammes. Training in estimating lines from .5 to 1.5 inches long (resulting in a reduction of error to 25 per cent of the initial

amount) resulted in no improvement in the estimation of lines 6 to 12 inches long.

Training in perceiving words containing *e* and *s* gave a certain amount of improvement in speed and accuracy in that special ability. In the ability to perceive words containing *i* and *t*, *s* and *p*, *c* and *a*, *e* and *r*, *a* and *n*, *l* and *o*, misspelled words and *A*'s, there was an improvement in speed of only 39 per cent as much as in the ability specially trained, and in accuracy of only 25 per cent as much. Training in perceiving English verbs gave a reduction in time of nearly 21 per cent and in omissions of 70 per cent. The ability to perceive other parts of speech showed a reduction in time of 3 per cent, but an *increase* in omissions of over 100 per cent.

These experiments showed very clearly the influence of: (1) the acquisition during special training of ideas of method of general utility, and also (2) of facility with certain elements that appeared in many other complexes. Instances of (1) are learning in the 10 to 100 cm. training series that one has a tendency to overestimate all areas and consciously making a discount for this tendency, no matter what the size or shape of the surface may be; learning to look especially for the less common letter (*e. g.*, *s* in the case of *e–s* words, *p* in the case of *s–p* words) in the training series, and adopting the habit for all similar work; learning to estimate areas in comparison with a mental standard rather than the objective 1 sq. cm., 25 sq. cm., and 100 sq. cm. squares which each experimenter had before him (after one gets mental standards of the areas he judges more accurately if he pays no attention whatever to the objective standards). An instance of (2) is the uniform increase of speed of eye movements in all the perception tests through training in one, an increase often gained at the expense of accuracy.

In the opinion of the authors these experiments show that:

Improvement in any single mental function need not improve the ability in functions commonly called by the same name. It may injure it.

Improvement in any single mental function rarely brings about equal improvement in any other function, no matter how similar, for the working of every mental function-group is conditioned by the nature of the data in each particular case.

The very slight amount of variation in the nature of the data necessary to affect the efficiency of a function-group makes it fair to infer that no change in data, however slight, is without effect on the function. The loss in the efficiency of a function trained with certain data, as we pass to data more and more unlike the first, makes it fair to infer that there is always a point where the loss is complete, a point beyond which the influence of the training has not extended. The

rapidity of this loss, that is, its amount in the case of data very similar to the data on which the function was trained, makes it fair to infer that this point is nearer than has been supposed.

The general consideration of the cases of retention or of loss of practice effect seems to make it likely that spread of practice occurs only where identical elements are concerned in the influencing and influenced function.

Coover (Coover, J. E., "Formal Discipline from the Standpoint of Experimental Psychology," *Psychological Review Monographs*, 20, No. 3, 1916) much later performed similar experiments in marking out words and in estimating weights. The cancellation test showed a gain of 44 per cent in the training series and 33 per cent in the end tests, or 75 per cent as much in the end tests as in the training series. This transfer effect is larger than that found by Thorndike and Woodworth. Coover's experiment in estimating weights was made by training two persons with a set of 17 blocks ranging from 40 to 120 grammes. Each person made 1,700 judgments in the practice series. They were tested before and after training in estimating 10 common objects, each averaging 67.5 grammes in weight. There was a gain of 23 per cent in the training series and 29 per cent in the end tests with the set of 10 smaller objects, but a loss of 100 per cent with the larger objects. The gain in estimating the smaller sets was apparently greater than in the training series itself.

Many experiments have been made with school subjects to determine the effects of practice in one subject upon efficiency in other subjects. The most notable of these was performed by Rugg (Rugg, Harold O., *The Experimental Determination of Mental Discipline in School Studies*, 1916, University of Illinois). He made a study of the influence of training in descriptive geometry. He used a great variety of test material, some of it arithmetical, some geometrical. The experiments were given to 326 students in the University of Illinois, College of Engineering. As a control group he had 78 students in other colleges take the end tests but not the practice work. Rugg makes the following conclusions:

The study of descriptive geometry (under ordinary classroom conditions throughout a semester of fifteen weeks) in which such natural and not undue consideration is given to practice in geometrical visualization as is necessary for the solution of descriptive geometry problems operates:

(1) Substantially to increase the students' ability in solving problems requiring the mental manipulation of a geometrical nature, the content of which is distinctly different from the visual content of descriptive geometry itself.

(2) Substantially to increase the students' ability in solving problems requiring the mental manipulation of spatial elements of a slightly geometrical character, *i. e.*, problems utilizing the fundamental elements of geometry (the point, line, and plane), but apart from a geometrical setting and in such form as to offer no geometrical aids in solution.

(3) Substantially to increase the students' ability in solving problems requiring the mental manipulation of spatial elements of a completely non-geometrical nature, *i. e.*, problems in which the straight line and plane do not appear in any way whatsoever.

(4) The training effect of such study in descriptive geometry operates more efficiently in those problems whose visual content more closely resembles that of the training course itself, *i. e.*, in those problems whose imagery content is composed of combinations of points, lines, and planes, and in which the continuity of the manipulating movements approaches the continuity of those in the training course. (Rugg, pp. 114–115.)

Harris made a study of the effect of knowledge of Latin upon ability to spell English words by submitting a list of 50 words of Latin origin to 324 freshmen in the University of Illinois. He gives the following table:

TABLE 65

After Harris ('15)

YEARS OF LATIN	0	1	2	3	4
Number of students	90	41	95	54	44
Average	82.1	82.4	80.2	81.5	90.1

He further submitted to the same group of students 10 words of Latin origin which were to be defined. This test gave the following result:

TABLE 66

After Harris ('15)

YEARS OF LATIN	0	1	2	3	4
Number of students	90	41	95	54	44
Average	30.5	44.2	45.9	53.0	85.3

He also compared the grades in rhetoric of students who had had various amounts of Latin as follows:

TABLE 67

After Harris ('15)

YEARS OF LATIN	0	1	2	3	4
Number of students	53	41	66	28	26
Grade	77.2	79.2	79.5	80.6	81.8

Harris concludes:

From these various results the conclusions in so far as these students are concerned are obvious. In all fields the four-year Latin students showed a marked lead, and in all but the spelling—which I have considered above—there is a steady retrogression, although for the practical purposes the one-and-two-year Latin students might be classed together. (Quoted from Starch, *Educational Psychology*, pp. 234–235.)

A most exhaustive, critical analysis was recently made by Reed of all the experimental studies that had been made relating to the subject of transfer of training. In addition he repeated several of the original experiments and also performed a new set of experiments which he devised. His study is the latest important contribution to the subject. His own experiments tested transfer from the standpoint of association. He believes there is transfer of effects from one activity to another when associations are made relating to them. His point of view may be well summarized in direct quotations from his two monographs:

In any case, the spread of improvement from a special function is not general, but it is very specialized and affects only such other special

functions that are very similar to the one specially trained. The result of the test experiment in regard to the transfer of training is that the findings of Ebert and Meumann and the conclusions based upon them, that there is a general memorial function and that special training in one function improves the memory in general, are not confirmed. Nor is their theory confirmed that transfer from one function to another is in proportion as the functions are allied.*

Training in card sorting does not improve ability to typewrite. Training in estimating areas 10–100 sq. cm. does not improve ability to estimate similar areas over 200 sq. cm. in size. Training in estimating lines .5 to 1.5 inches long does not improve ability to estimate objects from 2.5 to 8.75 inches long when the latter consists of such things as envelopes, brushes, and wrenches. Training in estimating four intensities of sound does not improve ability to estimate the extent of arm movement. Training in cancelling parts of speech does not improve ability to cancel words having the letters *e* and *t*. Training in memorizing "Paradise Lost" does not improve the memory for Hugo's verse. Training in memorizing nonsense syllables does not increase the memory-span for letters, numbers, nonsense syllables, disconnected words, Latin-English vocabularies, poetry, and prose; nor the ability to memorize completely meaningless visual characters, Latin-English vocabularies, and passages of poetry and of prose. Training in memorizing prose substance does not improve the ability to memorize dates, nonsense syllables, poetry, points on a map, dictation, letters, and names. Training in memorizing tables does not improve ability to memorize dates, poetry, prose, prose substance, dictation, letters, and names. Memorizing poetry does not improve ability to memorize dates, poetry of another sort, prose, prose substance, points on a map, dictation, letters, and names.

I have also examined the results of experiments on the transfer of training by Bagley and Squire, Briggs, Burnet, Coover, Dallenbach, W. F. Dearborn, Foster, Hewins, Judd, Ruger, Scholkow and Judd, Wallin, Whipple, and Winch, but have not been able to make them the basis of a theoretical discussion because they were too indefinite, irregular, or complicated to bring within a consistent rule. However, no theory that is at all specific can explain all cases of reported transfer. The psychological factors in the cases of positive transfer described above were pointed out. In the cases of negative or zero transfer it is difficult to find common sensory stimuli, and common conceptual stimuli that may exist are too general to be effective. It is also difficult to find common conceptual or associative responses. But some cases of positive transfer are equally baffling; for example, training in

* "A Repetition of Ebert and Meumann's Practice Experiment on Memory," *Journal of Experimental Psychology*, 1917.

memorizing poetry has been found to improve the ability to locate points on a map and to memorize nonsense syllables, but interfered with the ability to learn poetry of another sort, prose, or prose substance. Memorizing tables improved the ability to locate points in a circle and to learn nonsense syllables, but interfered with the ability to learn dates, poetry, or prose. The difficulty with all these studies is that the associative processes were not investigated. If we knew what the common bonds of association had been in these cases of positive and negative transfer, we probably should have the clew to their explanation. The correlation between observable stimuli and observable responses is too irregular to make a consistent principle inferable with certainty, but such regular correlations as there are point quite definitely to the solution of the problem in the laws of association. It is to be hoped that future investigators of this problem will more carefully examine the internal facts of transfer, *i. e.*, the common associative bonds. *

Differences in an Individual's Abilities.—Were the doctrine of general discipline true, there ought to be no variations among our powers. The power gained in one capacity is said to be carried over to all others. All varieties of accomplishment dependent upon a given power ought then to be equally attained. For example, one ought to be as proficient in algebra as in history, as proficient in geometry as in algebra, as good in grammar as in botany. But it needs no demonstration to convince that there are great variations in accomplishment among different subjects by the same individual, and, what is more, these varieties in accomplishment often represent fundamental differences in capacity. One may be inclined to natural science and have poor mathematical ability, be a fine linguist and sadly lacking in mathematical reasoning, or skilful in music and poorly equipped for logic and philosophy. Who ever saw many musicians with a philosophical bent of mind? It is even true that a given individual may have rare power in algebraic mathematics, where all depends upon logical trains of thought and power of abstraction, but may be very inefficient in geometric mathematics, where

* "Associative Aids: I. Their relation to Learning, Retention, and Other Associations; II. Their Relation to Practice and the Transfer of Training." *Psychological Review*, 1918.

so much depends upon those qualities of visual imagination necessary to a good topographical mind. How many would be willing to be judged mentally for all situations by ability to spell? So generally is inaptitude for spelling recognized that no one jeopardizes his reputation by confessing to being far short in this particular. Probably many cases of poor orthography bespeak carelessness in the matter rather than the lack of ability, but multitudes justly take refuge under the plea of incapacity. It is but necessary to note also the ease with which some children learn to spell. Those who have to toil at it and then achieve indifferent results are apt to marvel at the celerity of the more favored ones. Thorndike (*Principles of Teaching*, p. 83) reports a class test in spelling which shows that the best speller had nineteen out of twenty words correct, while the poorest missed all but three. Any teacher in the work could duplicate the list.

Biological Evidence.—One of the most convincing arguments against the theory of formal discipline comes from biology. Exercise of an organ or function tends to produce development of that organ or function. While such exercise may have a general tonic effect upon the rest of the organism, growth and development are largely limited to the parts exercised. A study of the evolution of the various powers of body and mind showed clearly the effects of stimulations long continued upon given portions of the organism. (Bolton, *Principles of Education*, chap. IV.) We noted, for example, how special forms of activity have changed the muzzle and the feet of the polar bear; how particular modes of life have developed in other animals peculiar claws, teeth, hoofs, hair, eyes, or ears; how changes occur in plants when removed from one environment to another. In all of these it is evident that the application of new stimuli to a given organ or function made its effects manifest almost wholly in that limited portion. In a negative way the withdrawal of a particular stimulus causes atrophy in the special organ. One of the best illustrations of this is in the case of cave animals, whose eyes have atrophied and become rudimentary. The

animals as a whole are little affected. Similarly changes in hoofs, fur, legs, fins, or teeth, etc., take place with little correlative effect upon other portions of the animal.

The theory of the localization of function and all the facts supporting it are arguments against the theory of formal discipline. Special localized areas and special functions could never have been developed had not the effects of exercise been cumulative at certain points rather than evenly diffused. Nourishment was supplied to the particular parts in excess of that supplied to any other parts. Consequently growth and development followed in the particular directions. A given portion of the brain controlling a special function may be materially increased in development without much affecting other parts. Certain portions unexercised may atrophy without causing degeneration of other parts. Again, a given area may sometimes be completely excised without seriously affecting the remaining portions. Only in very low unspecialized forms may substitution of other areas take place. If the theory of general powers were true, any portion of the brain ought to be able to take on the function originally controlled by the part destroyed. If the doctrine of general powers were true, it would be inconceivable that localization and specialization should ever have taken place. Any organ ought, according to that theory, to be able to control any function, and undifferentiated, homogeneous structure would have served equally as well as the exceedingly complex, specialized brain which we possess. With the gradual isolation, insulation, and specialization of functions, however, efficiency has arisen.

Starch (*Educational Psychology*, 1919, p. 254) made an exhaustive evaluation of all of the principal studies that had been made down to that time. He offers the following conclusions:

> In formulating an opinion concerning general training effects resulting from training of special capacities, we must bear in mind that even where the transfer effect is considerable, as much as one-fourth to one-third as much as in the capacity specially trained, it is obviously more economical to give practice directly to the capacities which we want

to train rather than to do it indirectly with the hope that the improvement may be transferred to them. Concretely, even if the study of Latin under favorable methods of teaching does improve the spelling of English words, would it not be more economical to study directly the spelling of the words which are to be acquired? Knowledge of the most common Latin words from which the largest number of English words are derived could be obtained in a relatively short period of time, probably a year or even less. Learning to play the piano might help in learning to play the violin, but no sane person would devote very much time to the piano if his sole purpose were to learn to play the violin.

Even if mathematics may cause some improvement in reasoning about bargains, even if the study of Latin may increase English vocabulary, or even if a study of animal psychology did make a man a better teamster, these effects are relatively very small, and can be produced much more economically by a direct study of bargains, or of the origin and meaning of English words, or of driving horses. A course in mathematics or in Latin or in psychology will have to stand primarily on its own feet for the content that it offers or the skill that it develops. These by-products may be useful but they cannot be the sole purpose of the efforts put into a course. The value of a meal depends upon the meal itself and not upon the crumbs that fall from the table. Whenever a subject loses its content value through changed social conditions it seems mysteriously to acquire a great deal of disciplinary value.

An immense amount of confusion in the thinking about the problem of mental discipline and the value of school subjects, even on the part of distinguished thinkers, has resulted from a failure to discriminate between the effect of a certain kind of education and the native capacities of the individuals subjected to the education. Whenever allowance or deductions for differences in original ability have been made, the general disciplinary effect has been found to be much less, or, in many instances, even non-existent. To argue that because certain great leaders of men had a certain type of education, it must have produced their greatness, does not prove the point. They probably would have achieved distinction if they had had any other sort of education. If the chief argument for pursuing a given subject is that it selects the more able pupils, it would be much more economical to do so by a shorter and more certain method. Almost any fifteen or twenty mental tests that can be applied in a psychological laboratory in two hours would separate much more accurately the gifted from the stupid.

Finally, the upshot of the experimental and statistical inquiries into the transference of training is that effects of training are transferred in

smaller amounts and within much narrower limits than has commonly been assumed. This does not mean that there is no general mental discipline in any form of training, nor that the doctrine of formal discipline has been "exploded," but rather that the actual limits of general discipline have been more accurately defined. These limits, to be sure, seem to be much narrower than many are inclined to believe. So far as the value of school subjects is concerned, it means that the content value of a subject must be the prime reason and the general disciplinary value the secondary reason for pursuing it.

Types of Transfer.—Inasmuch as any physical work, no matter how complex, is made up of simple elements, it also follows that these elements can be woven into manifold new combinations. Whenever a new activity involves an element already learned, that part of the process does not need to be again mastered. However, it must be recognized that not only the element but also its connections have to be considered. One who has used the arm and hand in a variety of motions, which may be combined in using a brace and bit, a plane, a chisel, or a saw, or in adjusting watches, has not therefore mastered carpentry or watchmaking. If he has good general control of the hand he already has much capital to draw upon. But if the new process is an absolutely novel one as a whole and also in its elements, then what has been learned is of no avail in the new direction.

Similarly with mental operations. Almost any study involves elements that have been mastered in other connections. These elements are immediately serviceable. For example, in beginning the study of percentage it is found that the subject is mainly a combination of old principles and processes, with only a slight addition of new ones. Algebra grows right out of the mathematical ideas gained in arithmetic, and calculus is but an extension and recombination of arithmetic, algebra, geometry, and trigonometry. When the ordinary child begins geography, mathematics, Latin, or German he has had several years' experience in reading and writing. He knows the use of letters and symbols, has acquired some knowledge of language classification and rules. He has, in fact, multi-

tudes of elements as capital upon which he should immediately draw. Thus all studies are in a way related and to that extent the mastery of one helps in the acquisition of others.

But it must not be forgotten that the combination of old and even perfectly familiar elements is a difficult matter in itself. Old combinations may even be a hindrance, especially if too fixed. Bad habits of walking, talking, writing, singing, or thinking are harder to modify than new ones are to inculcate. In percentage all one has to do is to apply the knowledge of addition, subtraction, multiplication, division, and fractions. "All?" Yes. But, ay, there's the rub. A student said to me once before commencing the study of the science of education: "Why, all one has to do is to learn psychology and then just apply it." "Yes," I answered, "that is all you have to do." Before the year was over he discovered that learning to just apply it was a task not inferior in difficulty to anything he had ever undertaken.

It is not here maintained that the pursuit of a given subject can have no value in the study of another subject later pursued. It is claimed that exercise in a given direction produces greater growth of the special powers involved than in any other. Most subjects of instruction have a great many similar elements. As far as they have similar elements they are valuable for each other. The greater the number of identical elements in the two, the greater the value. Physics has a great many points in common with chemistry, geology with zoology, French with Latin, etc. All subjects are related to language, and consequently language illuminates them all. But when we select two that are as far apart as typewriting and arithmetic, or as card-playing and Chinese, it is certain that the pursuit of one does not put one far ahead in the accomplishment of the other. Would a doctor of philosophy have any advantage over a high-school graduate in learning stenography or music? According to the theory of formal discipline, the years of study on thought problems ought to have increased ability in gaining the technic of music and typewriting—but it does not.

Effect of Ideals.—Next in value to the elements of old knowledge which are utilized in learning new things, there are certain ideals and attitudes toward work. There are no general faculties of attention, memory, and reason which attend, memorize, and reason about one thing as well as another by simply "connecting them up." But there are habits of attending to things, of trying to memorize, trying to reason; in short, habits of striving for excellence, which are no mean possession. In fact, oftentimes the ideals of excellence and of application to duty are among the most valuable assets which the schoolboy acquires. But he acquires these on the farm, in the store, or in the shop as well as in the school—frequently better. It depends largely upon the kind of associates he has. The value that we often so erroneously ascribe to a given subject or kind of work is more truthfully a benefit with which our parents, teachers, and associates should be credited. They may inculcate a desirable attitude toward all work which is of immense value in every relation in life.

Judd is regarded as one of the chief scientific exponents of the theory of transfer of training. It is true that he does maintain that transfer may take place. He cites experimental evidence to prove the point. At the same time he does not maintain that transfer takes place equally in all directions. Sometimes there is much transfer, sometimes little, sometimes none, and sometimes the results may be a hindrance. That is, sometimes the very learning of one habit may hinder the acquisition of some other habit.

He makes a real contribution in pointing out that transfer takes place through the formation of associations, through applying and generalizing experiences. For example, Latin will improve ability in English very decidedly if an attempt is made to show the relation between Latin and English; school studies may strengthen one for life's duties, provided the relation is shown between what is learned in school and life problems outside. Too often the work of the school is isolated in two ways, (*a*) in being unrelated to life and (*b*) in

each topic and subject being unrelated to all the rest. Judd says:

> There is no inherent reason in the psychology of the individual mind or in the psychology of any subject of instruction for supposing that experience cannot be generalized. On the other hand, there is no reason to assume that experience of any type will infallibly carry over into any other sphere whatsoever. . . . Everywhere in human experience there are large possibilities of generalizing experience, and everywhere in school there is danger that experience will be narrowly specialized. (*The Psychology of High School Subjects*, p. 420.)

Application in Curriculum-Making.—If one maintains that powers are entirely general rather than largely special, one must logically maintain that it makes little difference as to what kind of facts are included in the course of study. Mental gymnastics is assumed to be the important thing. That theory imperils the whole theory of moral growth. It makes all the difference in the world what knowledge our boys and girls receive. Their feelings are aroused by knowledge, and their activities often determined directly by the facts they learn.

Even from the side of the intellect it makes much difference. Were mental gymnastics the only requisite of intellectual growth, we might separate a child from his fellows, set him to playing checkers or chess, or learning Russian or Choctaw, and then he would be fitted for society, be capable of judging of human actions as well as though he had come in contact with objective facts dealing with society and human activities.

Studies Should be Regarded as Worth While.—Why should subjects be studied if not for the intellectual gymnastics? We may ask a similar question about physical work. We can easily find good and sufficient reasons for doing physical and intellectual work without appealing to the theory of formal discipline. The work should be worth doing. If not, it should be left undone. The worthfulness of the ends secured through labor have been the dominating motives of all human work. No one normally goes through a treadmill existence

for the sake of doing the treading. In adult life one does not do intellectual work for the sake of the exercise. When we plan buildings, lay out political campaigns, develop war policies, or write books, we do not do so for the sake of the practice. The ends must appeal to us as being worth while in themselves. It may be that in executing a given kind of work we develop added power for similar kinds of work, but even that kind of motive would not keep us long at our task. The end to be accomplished must be the magnet which draws us irresistibly on.

The case is similar with children's activities. Normally they engage in all sorts of exercises for the sake of the end. Play has been defined as exercise which is careless of the ends to be secured. This is a false interpretation. Play not ruled by entrancing ends to be accomplished ceases to be play. True, when ends are accomplished, new objects are at once conceived as worthful and new plays engaged in. But play in which the end does not lure the child on becomes, like too much of his arithmetic and writing, mere drudgery. In these the objects are not understood or appreciated, and hence are distasteful.

Subjects should be studied because they are intrinsically valuable; because the possession of a knowledge of them is distinctly worth while. One of the highest arts of the pedagogue is to make the pupil see and appreciate these values, and consequently to be so attracted by the acquisition that he is unsatisfied without them. The boy should study arithmetic, not because he is to gain mental muscle for the practice of law or politics, but because the arithmetic is an indispensable thing for him to know. He ought to be led to appreciate this, and can be under skilful guidance. He ought to study Latin because the Latin has intrinsic value. Grammar ought to be studied not for the gymnastics afforded, but for the sake of the grammar. If the disciplinarian's contentions were true, then the kind of arithmetic and grammar would be immaterial. The most antiquated cases in arithmetic and the most obsolete grammatical forms would serve

just as well as modern subject-matter. The text-books on geography, arithmetic, and grammar of our grandfathers would do just as well as those containing more modern information if gymnastics were all that is required. The formalist is apt to say that discipline for power is the object of all study, that the facts learned are forgotten anyway, that it makes little difference what one studies provided only that he studies hard (and pursues the formalist's favorite studies!).

Need for Varied Experiences.—If the emotions, for example, are to be properly developed the mind must be occupied with ideas which arouse the emotions. How can the emotion of patriotism be aroused except through ideas which deal with fidelity, loyalty, and the necessity of the fraternal spirit? How can sympathy be awakened without knowledge of the feelings of joy, sorrow, sadness, despondency? These can only be gained by witnessing them in others and experiencing them ourselves. No purely intellectual consideration alone can bring into life the deepest emotions. Emotional experience is an absolute condition of development. Arithmetic will not do it, geometry will not do it, linguistic drill fails, manual training fails, all fail except that which touches the germinal life of the emotions and adds to their potentialities. Darwin tells us that his later life was full of regret that he had no interest in music and art. The æsthetic failed completely to find response in him. He ascribes as a cause the excessive devotion through a long life to purely intellectual pursuits. His mind had become unsymmetrical by the hyperactivity in certain directions and the absence of exercise in others.

We rightly say that ethical growth and culture are the highest ends of education. But in practice we ignore all laws for the attainment of these ends by centring the main current of the child's school life upon purely intellectual activities. We profess to be deeply concerned lest the child wander from the paths of rectitude, but instead of pre-empting his mind with high ideals, such as could be gathered from literature and history, we cause him to spend most of his school

life in learning rules of mathematics and language and acquiring some degree of dexterity in handling their forms and formulas. Now, arithmetic touches a great many rules, but nowhere in it could I ever discover the "Golden Rule." No, the only way in which one could learn to do unto others as he would be done by is by associating with others and learning the meaning of altruism. This can be done partly through the living contact and partly through subjects which deal with similar situations. If moral growth is to be secured, instruction must have a moral content, and the child must be exercised in dealing with situations involving moral activities, and in a higher stage his moral judgment must be appealed to.

If we wish to secure development in any direction, specific exercise and nourishment must enter into the course of education. To stint in any direction is to dwarf growth in that particular, to overemphasize in a given direction is to produce abnormality or arrest of development. Excessive culture of physical powers and disregard for the intellectual and moral growth produces the brute; excessive intellectual culture alone develops the logician; while excessive cultivation of the emotions without due balance in other qualities produces sickly sentimentalism with blind, ungovernable passion. Many people are now frankly sceptical of the idea that education means merely mental gymnastics and are demanding that pupils be trained for specific situations in life. In order to do this the curriculum must be so broadened and enriched that the instinctive potentialities will be developed and utilized in the best interest of society.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. How did the theory of formal discipline arise? It is interesting to note that teachers developed the theory and laymen challenged it. 2. To what extent do teachers apparently believe in formal discipline? 3. Do laymen apparently believe in formal discipline? 4. Suggest an experiment to test the theory. 5. Very few of the specific facts learned in college are used directly in after-life. How then can a disbeliever in the transfer effects of study recommend a college education? 6. If the ex-

tremists' contentions regarding transfer effects were true, would it be scientific to have pupils study grammar as a means of developing ideals of good citizenship? 7. In every-day life do people with "common sense" exercise on one thing in order to learn to do something else? 8. What effect does a belief or a disbelief in the theory have upon the making of the school curriculum? Are such effects observable in present-day curricula? 9. On what basis would you justify the high-school study of algebra, Latin? 10. What should be the basis for the selection of any subjects or topics in a curriculum? 11. How can the pupil be helped to develop habits of accuracy, neatness, punctuality, truthfulness, good workmanship?

References for Further Reading

1. Bolton, *Principles of Education*, chap. XXVIII.
2. Cameron, *Psychology and the School*, chap. XIII.
3. Colvin, *The Learning Process*, chap. XIV.
4. Heck, *Formal Discipline.* Entire book.
5. James, *Principles of Psychology*, vol. I, chap. XVI.
6. Judd, *The Psychology of High School Subjects*, chap. XVII.
7. Starch, *Educational Psychology*, chap. XIII.
8. Thorndike, *Principles of Teaching*, chap. XV.
9. Woodworth, *Psychology: A Study of Mental Life*, p. 316.

PART IV

MEASUREMENT IN EDUCATIONAL PSYCHOLOGY

CHAPTER XIX

MEASURING MENTAL ABILITY

Beginnings of the Movement.—During the last decade a great deal of interest has been developed in connection with methods of measuring mental ability. It is very important in the classification of pupils in school and in vocational guidance and placement.

The first real attempt to develop a scale for measuring mental ability was made by Binet in 1904 for the purpose of separating the feeble-minded from normal persons. In that year an educational regulation in Paris required that the mentally defective in the schools be discovered. Binet tested several average children of each age, and then standardized the tests of ability for each age. The tests were published in 1905 in the *L'Année Psychologique*. They were revised in 1908 and again in 1911. From that time they have been widely used.

While low-grade feeble-mindedness is readily distinguishable there are many border-line cases that are difficult to distinguish. It is also true that during the earlier years of childhood it is hard to determine whether a given child is merely backward from lack of training or really subnormal in intelligence. Terman says that even teachers are apt to confuse real intelligence with facility in reading, capacity for memorizing, and are "deceived by a sprightly attitude, a sympathetic expression, a glance of the eye, or a chance 'bump' on the head." (*The Measurement of Intelligence*, p. 31.)

Binet tried to devise questions and exercises which would call for intelligence rather than merely information in giving the answer. To arrange tests that will do that is a difficult thing. The Binet tests did not fully accomplish that, as will be seen by examining the tests. A great many investigators

have studied the tests, modified them and much improved them, but even now they are far from perfect. However, they look in the right direction.

Doctor Kuhlmann ("The Present Status of the Binet and Simon Tests of the Intelligence of Children," *Journal of Psycho-Asthenics*, vol. XVI, No. 3, 1912), says of the Binet tests that

> The tests are the first of their kind that have ever been offered for the purpose of determining the degree of intelligence of children in terms of mental ages. They aim to and do accomplish much more than anything we have had heretofore. For this reason they have become at once widely popular. They have been used in many public schools throughout this country and abroad, and in a number of schools for defective children, reformatories and prisons for the practical purposes of grading intelligence.

The essential features to be noted in the Binet tests and their use is: (1) There is a set of questions or directions for each age in which the child is asked to give some information, some judgment, or to do something. (2) These exercises have been given so many times and the results so carefully recorded and studied that it is known just how many of the exercises for a given age a child of that age will answer correctly. (3) If a child of a given age answers correctly the average number of exercises for that age the child is considered normal. (4) If a child of a given age fails to answer correctly an average number of exercises for his age, but can answer all for the next year below, he is judged to be mentally the year below. (5) If he can answer correctly an average number of exercises for a higher age he is assigned the higher mental age.

Because of the amount of space it would require to reproduce all of the Binet tests, only a synopsis and typical illustrations are given here. They have been considerably revised, amplified, and improved, and those who are interested should read Terman's *The Measurement of Intelligence.* He gives there an extended and carefully selected bibliography, which will enable one to do more exhaustive reading.

Synopsis of the Binet-Simon Tests.—The following is a

very brief statement of the nature of the fifty-four tests in the 1911 revision of the Binet-Simon tests. The statement is taken verbatim from the authorized translation made by Doctor Clara Harrison Town (*A Method of Measuring the Development of the Intelligence of Young Children*, 1913.)

The series of tests used in the method, grouped according to age, is as follows:

Three Years

Shows nose, eyes, and mouth.
Repeats two digits.
Enumerates objects in a picture.
Gives family name.
Repeats a sentence of six syllables.

Four Years

Gives own sex.
Names key, knife, and penny.
Repeats three digits.
Compares two lines.

Five Years

Compares two weights.
Copies a square.
Repeats a sentence of ten syllables.
Counts four pennies.
Game of patience with two pieces.

Six Years

Distinguishes between morning and afternoon.
Defines in terms of use.
Copies a lozenge.
Counts thirteen pennies.
Compares faces from the æsthetic point of view.

Seven Years

Right hand; left ear.
Describes a picture.
Executes three commissions.
Gives value of nine sous, three of which are double.
Names four colors.

Eight Years

Compares two remembered objects.
Counts from 20 to 0.
Indicates omissions in pictures.
Gives day and date.
Repeats five digits.

Nine Years

Gives change from twenty sous.
Defines in terms superior to use.
Recognizes all the pieces of our money.
Enumerates the months.
Understands easy questions.

Ten Years

Arranges five weights.
Copies drawings from memory.
Criticises absurd statements.
Understands difficult questions.
Uses three given words in two sentences.

Twelve Years

Resists suggestion (length of lines).
Composes one sentence containing three given words.
Says more than sixty words in three minutes.
Defines abstract terms.
Discovers the sense of a sentence the words of which are mixed.

Fifteen Years

Repeats seven digits.
Gives three rhymes.
Repeats a sentence of twenty-six syllables.
Interprets a picture.
Solves a problem from several facts.

Adult

Solves the paper-cutting test.
Rearranges a triangle.
Gives differences in meanings of abstract terms.
Solves the question of the President.
Gives the résumé of the thought of Hervieu.

Illustrations of the Binet-Simon Tests.—The Binet tests (1911 revision) contain fifty-four different tests, intended to be graded, so that the average child of a given calendar age can answer reasonably the majority of questions for that age. The following are samples of the tests:

Age 3: *a.* The child is shown a picture of a man and a little boy drawing a cart loaded with various objects. The child is asked: "What is this?" To be counted correct, at least two objects in the picture must be mentioned.

b. Tell your name (including surname).

c. Point to your nose, eyes, mouth.

d. Two digits are uttered by the examiner, and the child is asked to repeat them.

e. Repeat after the examiner "It is cold. I'm hungry."

Age 4: *a.* Which of two lines (shown) is the longer?

b. Are you a little boy or a little girl?

c. Is asked to name several objects, as a knife, a key, a penny, etc.

d. Three digits are uttered by the examiner, and the child is asked to repeat them.

Age 9: *a.* What is a fork? What is a table? What is a chair? What is a horse? (If the child says a chair is "a seat," "four legs," or "furniture," etc., the answer is to be accepted.)

b. The child is to make change for a quarter when six cents' worth are bought in playing store.

c. "If you have missed a train, what must you do? If you have been struck by a playmate (or friend) who did not mean to do it, what must you do? If you have broken something belonging to some one else, what must you do?"

Terman's Revision of the Binet-Simon Tests.—Terman of Stanford has revised the Binet scale by adding to and modifying the tests made by Binet. By testing hundreds of children Terman has determined norms of what children of a given age can do. He says (*The Measurement of Intelligence*, p. 53): "A correct scale must cause the average child of 5 years to test exactly at 5, the average child at 6 to test exactly at 6, etc." He has improved the tests more than any one else.

In giving the examination to a child, begin with the lowest

age and go up the scale as far as he can proceed successfully. The test for the age at which he stops represents the mental age of the child. It is quite usual to speak of this in terms of "The Intelligence Quotient" (I. Q.), which is simply the mental age as revealed by the tests divided by the child's chronological age. For example, if a child is 8 years old by the almanac and tests 6 years old, his I. Q. is $\frac{6}{8}$, or usually expressed at 75. If the child is 6 years old chronologically and tests as high as the average eight-year-old, his I. Q. is $\frac{8}{6}$, or usually expressed as 133, the decimal point being omitted in each case. Any I. Q. below 90 represents a subnormal condition, any I. Q. above 110 represents superiority. Terman regards I. Q.'s from 90–100 as representing average intelligence, those from 110–120 as representing superior intelligence, and from 120 to 140 as very superior. Not too much significance should be attached if the variation is only a few points. If the variation is from 10 to 20 points, however, it may be regarded as quite significant.

The next six tests are selected from Terman. Those selected are intended to be typical of tests that really test intelligence and not merely information. The Roman numerals refer to the age of the child who can answer the questions if normal in development. The Arabic figures refer to the number of the test.

One of the Terman tests, by many considered among the best, is the vocabulary test. It is given at various ages. From a standardized list of words the child is asked to give definitions of as many words as possible in a given time. Any simple explanation showing comprehension of the word is accepted. The words include orange, bonfire, roar, gown, top, peculiarity, coinage, mosaic, bewail, disproportionate, homunculus, cameo, shagreen, limpet, conflict, etc. The number of words defined correctly is multiplied by 180, giving the approximate vocabulary. The words were selected by taking the last word of every sixth column in an 18,000-word dictionary. Thus, a child who defines 25 words correctly has a vocabulary of 4,500 words.

The following are the standards for different years, as determined by the vocabulary reached by 60 to 65 per cent of the subjects of the various mental levels:

8 years	20 words	vocabulary 3,600
10 years	30 words	vocabulary 5,400
12 years	40 words	vocabulary 7,200
14 years	50 words	vocabulary 9,000
Average adult	65 words	vocabulary 11,700
Superior adult	75 words	vocabulary 13,500

Although the form of the definition is significant, it is not taken into consideration in scoring. The test is intended to explore the range of ideas rather than the evolution of thought forms. When it is evident that the child has one fairly correct meaning for a word, he is given full credit for it, however poorly the definition may have been stated. (Terman, *The Measurement of Intelligence*, p. 226.)

Another test by Terman for the tenth year consists in having the child say as many words as he can think of in three minutes. The test is considered passed if sixty words, not including repetitions, are given.

VIII, 1. The ball-and-field test. (Score 2, inferior plan.)

Procedure. Draw a circle about two and one-half inches in diameter, leaving a small gap in the side next the child. Say: "Let us suppose that your baseball has been lost in this round field. You have no idea what part of the field it is in. You don't know what direction it came from, how it got there, or with what force it came. All you know is that the ball is lost somewhere in the field. Now, take this pencil and mark out a path to show me how you would hunt for the ball so as to be sure not to miss it. Begin at the gate and show me what path you would take."

Give the instructions always as worded above. Avoid using an expression like "Show me how you would walk around in the field"; the word around might suggest a circular path. (Terman, *The Measurement of Intelligence*, chap. XIV, p. 210.)

VIII, 4. Give similarities; two things.

Procedure. Say to the child: "I am going to name two things which are alike in some way, and I want you to tell me how they are alike. Wood and coal: in what way are they alike?" Proceed in the same manner with:

An apple and a peach.
Iron and silver.
A ship and an automobile.

(Terman, *The Measurement of Intelligence*, chap. XIV, p. 217.)

XIV, 5. Arithmetical Reasoning.

Procedure. The following problems, printed in clear type, are shown one at a time to the subject, who reads each problem aloud and (with the printed problem still before him) finds the answer without the use of pencil or paper.

(*a*) If a man's salary is $20 a week and he spends $14 a week, how long will it take him to save $300?

(*b*) If 2 pencils cost 5 cents, how many pencils can you buy for 50 cents?

(*c*) At 15 cents a yard, how much will 7 feet of cloth cost?

Only one minute is allowed for each problem, but nothing is said about hurrying. While one problem is being solved, the others should be hidden from view. It is not permissible, if the subject gives an incorrect answer, to ask him to solve the problem again. The following exception, however, is made to this rule: If the answer given to the third problem indicates that the word yard has been read as feet, the subject is asked to read the problem through again carefully (aloud) and to tell how he solved it. No further help of any kind may be given.

Scoring. Two of the three problems must be solved correctly within the minute allotted to each. No credit is allowed for correct method if the answer is wrong.

(Terman, *The Measurement of Intelligence*, chap. XVIII, p. 319. The selections from Terman are used by permission of and by special arrangement with Houghton Mifflin Company, the authorized publishers.)

XIV, 6. Reversing hands of clock.

Procedure. Say to the subject: "Suppose it is six-twenty-two o'clock, that is, twenty-two minutes after six; can you see in your mind where the large hand would be and where the small hand would be?" Subjects of 12 to 14 year intelligence practically always answer this in the affirmative. Then continue: "Now, suppose the two hands of the clock were to trade places, so that the large hand takes the place where the small hand was and the small hand takes the place where the large hand was. What time would it then be?"

Repeat the test with the hands at 8:10 (10 minutes after 8), and again with the hands at 2:46 (14 minutes before 3).

The subject is not allowed to look at a clock or watch or to aid himself by drawing, but must work out the problem mentally. As a rule the answer is given within a few seconds, or not at all. If an answer is not forthcoming within two minutes the score is failure.

Scoring. The test is passed if two of the three problems are solved within the following range of accuracy: the first solution is considered

correct if the answer falls between 4:30 and 4:35, inclusive; the second if the answer falls between 1:40 and 1:45, and the third if the answer falls between 9:10 and 9:15.

(Terman, *The Measurement of Intelligence*, chap. XVIII, p. 321. The selections from Terman are used by permission of and by special arrangement with Houghton Mifflin Company, the authorized publishers.)

The Army "Alpha" Tests.—The following extracts from the army "alpha" tests are copied, with permission, from the army tests used so extensively during the war. The "alpha" test, from which the selections are taken, is the most widely known. This was given to over 2,000,000 men during the war, and has been repeated thousands of times since in courses in mental measurement, in college entrance examinations, and to some extent in vocational guidance. No other test is therefore so well standardized. The great majority of all other tests constructed since have incorporated many of its features. Practically all use a combination of the Binet-Simon and the army alpha.

Form 6, *Group Examination Alpha*, *Feb.* 8, 1918*

TEST 2

Get the answers to these examples as quickly as you can. Use the side of this page to figure on if you need to.

1. How many are 40 guns and 6 guns?........... *Answer* (   )
2. If you save $6 a month for 5 months, how much will you save?............................ *Answer* (   )
3. If 32 men are divided into squads of 8, how many squads will there be?...................... *Answer* (   )
4. Mike had 11 cigars. He bought 3 more and then smoked 6. How many cigars did he have left?.................................... *Answer* (   )
5. A company advanced 6 miles and retreated 3 miles. How far was it then from its first position?.................................. *Answer* (   )
15. A ship has provisions to last her crew of 600 men 6 months. How long would it last 800 men? *Answer* (   )

* In the following excerpts from various tests it has not always been possible to reproduce exactly the original arrangement and type.

20. A commission house which had already supplied 1,897 barrels of apples to a cantonment delivered the remainder of its stock to 28 mess halls. Of this remainder each mess hall received 47 barrels. What was the total number of barrels supplied? .... *Answer* (   )

Test 3

This is a test of common sense. Below are sixteen questions. Three answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the best answer to each question.

1. If plants are dying for lack of rain, you should
   - ☐ water them
   - ☐ ask a florist's advice
   - ☐ put fertilizer around them
2. A house is better than a tent, because
   - ☐ it costs more
   - ☐ it is more comfortable
   - ☐ it is made of wood
10. Why should all parents be made to send their children to school? Because
   - ☐ it prepares them for adult life
   - ☐ it keeps them out of mischief
   - ☐ they are too young to work
16. Why do some men who could afford to own a house live in a rented one? Because
   - ☐ they don't have to pay taxes
   - ☐ they don't have to buy a rented house
   - ☐ they can make more by investing the money the house would cost

Test 4

If the two words of a pair mean the same or nearly the same, draw a line under *same*. If they mean the opposite or nearly the opposite, draw a line under *opposite*. If you cannot be sure, guess.

1.	cold—hot	same—opposite	1
2.	long—short	same—opposite	2
3.	bare—naked	same—opposite	3
4.	joy—happiness	same—opposite	4
5.	find—lose	same—opposite	5
16.	knave—villain	same—opposite	16

17. null—void. . . . . .same—opposite 17
18. wax—wane. . . . . .same—opposite 18
19. adversary—colleague. . . . . .same—opposite 19
20. altruistic—egotistic. . . . . .same—opposite 20
36. suavity—asperity. . . . . .same—opposite 36
37. perfunctory—meticulous. . . . . .same—opposite 37
38. lugubrious—maudlin. . . . . .same—opposite 38
39. desuetude—disuse. . . . . .same—opposite 39
40. adventitious—accidental. . . . . .same—opposite 40

Test 5

The words A EATS COW GRASS in that order are mixed up and don't make a sentence; but they would make a sentence if put in the right order—A COW EATS GRASS—and this statement is true.

Again, the words HORSES FEATHERS HAVE ALL would make a sentence if put in the order ALL HORSES HAVE FEATHERS, but this statement is false.

Below are twenty-four mixed-up sentences. Some of them are true and some are false. When I say "go," take these sentences one at a time. Think what each **would** say if the words were straightened out, but don't write them yourself. Then, if what it **would** say is true, draw a line under the word *true;* if what it **would** say is false, draw a line under the word *false.* If you cannot be sure, guess. Begin with No. 1 and work right down the page until time is called.

1. cows milk give. . . . . .true—false 1
2. write are with to pencils. . . . . .true—false 2
3. are and apples long thin. . . . . .true—false 3
4. east the in rises sun the. . . . . .true—false 4
5. months warmest are summer the. . . . . .true—false 5
15. Washington canal 1776 Panama the in built. . . . . .true—false 15
24. inflict men pain needless cruel sometimes. . . . . .true—false 24

Test 6

Look at each row of numbers below, and on the two dotted lines write the two numbers that should come next.

2	3	4	5	6	7	....	....
5	10	15	20	25	30	....	....
10	9	8	7	6	5	....	....
1	4	9	16	25	36	....	....
21	18	16	15	12	10	....	....
4	8	10	20	22	44	....	....

Test 7

In each of the lines below, the first two words are related to each other in some way. What you are to do in each line is to see what the relation is between the first two words, and underline the word in heavy type that is related in the same way to the third word. Begin with No. 1 and mark as many sets as you can before time is called.

1. dog—bark:: cat—**chair mew fire house** 1
2. foot—man:: hoof—**corn tree cow hoe** 2
3. dog—puppy:: cat—**kitten dog tiger horse** 3
4. wash—face:: sweep—**clean broom floor straw** 4
5. door—house:: gate—**swing hinges yard latch** 5
21. cellar—attic:: bottom—**well tub top house** 21
22. man—arm:: tree—**shrub limb flower bark** 22
23. suitcase—clothing:: purse—**purchase money string stolen** 23
24. knitting—girls:: carpentry—**trade houses boys lumber** 24
25. arteries—body:: railroads—**country train crossing accident** 25
36. order—confusion:: peace—**part treaty war enemy** 36
37. education—ignorance:: wealth—**poverty riches health comfort** 37
38. 10—100:: 1000—**money 10000 20000 wealth** 38
39. imitate—copy:: invent—**study Edison machine originate** 39
40. historian—facts:: novelist—**fiction Dickens writer book** 40

Test 8

In each of the sentences below you have four choices for the last word. Only one of them is correct. In each sentence draw a line under the one of these four words which makes the truest sentence. If you cannot be sure, guess.

1. Boston is in Connecticut Rhode Island Maine Massachusetts 1
2. Euchre is played with dice rackets cards pins 2
3. The Arabian is a kind of horse goat cow sheep 3
4. The most prominent industry of Milwaukee is fish brewing flour automobiles 4
5. Turquoise is usually yellow red green blue 5
21. The cutlass is a kind of sword musket cannon pistol 21
22. The Corona is a kind of phonograph multigraph adding-machine typewriter 22
23. Indigo is a food drink color fabric 23
24. The xylophone is used in lithography music stenography book-binding 24
25. Madras is a drink fabric food dance 25
36. The Battle of Lexington was fought in 1620 1775 1812 1864 36
37. The kilowatt is used in measuring rainfall wind power electricity water-power 37

38. The Buick car is made in Toledo Flint Buffalo Detroit.... 38
39. Among the allies of Germany is Bulgaria Norway Rumania Portugal.................................... 39
40. An eight-sided figure is called a trapezium scholium parallelogram octagon.................................... 40

Yerkes's Point Scale.—Various other modifications have been suggested. Among the most notable are those of Pintner and Yerkes. Pintner believed that too much depended upon the use of language, and his tests consist chiefly of attempts to *do* something, as, for example, putting together the parts of the form-board and dissected pictures. (Pintner, Rudolf, and Paterson, Donald: *A Scale of Performance Tests*, D. Appleton, 1917.) Yerkes used many of the Binet tests, but assigned a given number of points or credits to the answers or actions. This makes a rather more accurate evaluation than the "all or none" method of Binet. (Yerkes, Robert M., Bridges, James W., and Hardwick, Rose S.: *A Point Scale for Measuring Mental Ability*, Warwick and York, 1915.) The army intelligence tests and most of the current intelligence tests follow largely the "point-scale" method.

The National Intelligence Tests.—One of the latest sets of group intelligence tests is the *National Intelligence Tests* (World Book Company, 1920), prepared by a research council composed of Doctor Melvin E. Haggerty, University of Minnesota, Doctor Lewis M. Terman, Stanford University, Doctor Edward L. Thorndike, Columbia University, Doctor Guy M. Whipple, University of Pittsburgh, and Doctor Robert M. Yerkes, chairman, Harvard University. This research council was selected by the General Education Board in March, 1919. The importance and magnitude of their task is indicated by the fact that they were granted $25,000 with which to prepare the tests for the measurement of the intelligence of school children.

The tests include two groups of five each.

These groups are designated Scale A and Scale B. Scale A consists of Test 1, Arithmetical Reasoning; Test 2, Sentence Completion; Test 3, Logical Selection; Test 4, Same—Opposite; Test 5, Symbol-Digit.

Scale B consists of Test 1, Computation; Test 2, Information; Test 3, Vocabulary; Test 4, Analogies; Test 5, Comparison. Materials were simultaneously prepared by various members of the committee for five alternative forms of each test. These several forms of the tests were carefully equalized and methods of scoring determined.

The ten tests are arranged in two groups, in order that the period of examination may not greatly exceed thirty minutes. Either Scale A or Scale B may be used alone, and either will serve as a convenient method for the rapid survey of a school system; but the committee recommends that both scales be given preferably on different days. The second rating then may be used as a check on the first, and serious discrepancy will suggest to the teacher the desirability of individual examination. . . .

The scales having been assembled and printed, the committee was enabled to secure tentative norms to be used as standards for comparison of scores through the generous co-operation of Messrs. J. Freeman Guy, J. L. Stenquist, and Mrs. Helen T. Woolley. Miss Margaret V. Cobb organized and directed the examinations which were made in Washington for the purpose of equalizing the different forms of the scales, and also the co-operative examining which supplied the data for norms. In addition she took charge for the committee of assembling, editing, and printing the materials for the several tests in their various forms, and in the numerous other ways facilitated the preparation of the methods and increased their serviceability.

The National Intelligence Tests thus prepared are primarily an adaptation for school purposes of the group intelligence tests used in the examination of recruits in the United States army. They are planned for use in Grades 3 to 8, and with pupils entering high school. These tests may be successfully conducted and scored by the teacher or supervisor who is sufficiently interested to secure for himself the necessary brief instruction and training in their use. (*National Intelligence Tests: Manual of Directions*, 1920, pp. 3–4.)

Scale B, Form 1, Edition 2.

EXERCISE I

Do this work in arithmetic as quickly as you can without making mistakes. Try each example as you come to it. Look carefully at each one to see what you are to do.

Begin here	(1)	(2)	(3)	(4)
	Add	Multiply	Add	Subtract
	4	4 × 5 =	32	13
	2		25	5
			19	

(5) Divide	(6) Multiply	(7) Divide	(8) Subtract
$11 \div 3 =$	$\begin{array}{r} 5073 \\ 9 \\ \hline \end{array}$	$37\overline{)14282}$	$6/7 - 4/5 =$

(9) Divide	(10) Multiply
$3/4 \div 5 =$	$\begin{array}{r} 358\frac{1}{3} \\ 26 \\ \hline \end{array}$

EXERCISE II

Samples { Sheep eat mostly nuts *grass* fruits bread
The number of cents in a dime is 2 5 *10* 25

In each sentence draw a line under the one word that makes the sentence true.

Begin here
1. The number of days in a week is 5 6 7 12.................. 1
2. The kitten is the young of the dog cat lion sheep............ 2
3. The day before Thursday is Wednesday Tuesday Friday Monday 3
4. Cheese comes from butter plants eggs milk................... 4
5. Leather comes from cotton wool skins bark.................. 5

Scale B, Form 1, Edition 2.

TEST 2

In each sentence draw a line under the one word that makes the sentence true, as shown in the samples.

Samples { Sheep eat mostly nuts *grass* fruits bread
The number of cents in a dime is 2 5 *10* 25

Begin here
16. The incubator is useful in raising cattle chickens corn cotton 16
17. Boston is in Connecticut Maine Massachusetts Rhode Island 17
18. A State famous for oranges is Alabama California Louisiana Texas.. 18
19. The number of weeks in a month is about 2 4 6 8.......... 19
20. Cambric is a cloth color dance food........................ 20

EXERCISE III

Samples { Can cows eat?....................*Yes* No
Do stones swim?.................Yes *No*

Read each question and draw a line under the right answer.

6. Do trees ever grow on moist land? .... Yes No
7. Are newspapers printed in churches? .... Yes No
8. Is stealing a proper pastime? .... Yes No
9. Are steeples commonly found in barrels? .... Yes No
10. Is furniture usually visible? .... Yes No

Test 3

Draw a line under the right answer to each question. Do as many as you can.

6. Do bears have legs? .... Yes No
7. Do daisies bloom in meadows? .... Yes No
8. Does ice make water warmer? .... Yes No
9. Does a dollar have eyes? .... Yes No
10. Is red a color? .... Yes No

Test 4

Read carefully the first three words in each line. Then read the last four and draw a line under the right one.

Samples
- *shoe—foot*.... *hat*—coat nose see *head*
- *sky—blue*..... *grass*—grows summer *green* tall
- *bird—sing*..... *dog*—tail *bark* walk kennel
- *bird—fly*...... *dog*—tail bark *walk* kennel
- *dress—cloth*... *hat*—head wear band *straw*

Begin here

1. *finger—hand*........ *toe*—box foot doll coat 1
2. *cannon—shoots*...... *bell*—rings door metal maid 2
3. *sweet—sugar*........ *sour*—sweet cake vinegar man 3
4. *handle—hammer*..... *knob*—key room shut door 4
5. *suitcase—clothing*.... *purse*—purchase money string stolen..... 5

EXERCISE V

If the two things in a pair are the same, write *S* on the dotted line between them. If they are different, write *D* on the dotted line between them. Do each one as you come to it.

21059876 21059876
Siegel P. D. .... Seigel P. D.

Standardized College Entrance Examinations.—Intelligence tests are being tried in various universities as a substitute for or supplement to entrance examinations. It is too early to say how successful they will prove to be. In several places, notably Columbia University, they are reported to be very promising. Below is given part of two psychological examinations that have been devised by Thurstone, in the Division of Personnel and Psychology, Carnegie Institute of Technology. The first five and the last five are reproduced. The entire examination is not given here because of the length.

PSYCHOLOGICAL EXAMINATION

For College Freshmen and High-School Seniors

Part A—Time Limit: 20 Minutes

Do not open this pamphlet until you are told to do so by the examiner. This is a test to see how quickly and accurately you can think. The result of the test will be used by your advisers in order that they may know more about your abilities. On the inside pages there are 100 short problems. In each case you are told exactly what to do. Notice the instructions carefully. You may use the margin for figuring. Do not ask any questions. If you come to a problem that you do not understand, go to the next problem. You will be given only twenty minutes. Solve as many problems as you can in the time allowed. Solve the problems in the order given. Do not skip about on the page. Do not turn this page until you are told to begin.

1. Underline the two words that have the same logical relation to each other as *locomotive* and *train:* station horse hub baggage buggy

   Underline the two words that have the same logical relation to each other as *good* and *bad:* taste sweet conduct sour polite

   Underline the two words that have the same logical relation to each other as *flag* and *country:* cross purgatory Christianity Army president

   Underline the two words that have the same relation to each other as *ear* and *hear:* eye hair blue see eyebrow

2. Look at the following row of figures and fill in the two blank spaces:

   2 4 6 8 10 12 ... ...

   Look at the following row of figures and fill in the two blank spaces:

   1 7 2 7 3 7 ... ...

Look at the following row of figures and fill in the two blank spaces:

1 2 3 4 5 6 ... ...

3. Underline the two words that have the same relation to each other as *palace* and *King:* hut peasant barn farm city
4. If the conclusion to the following argument is true, underline true; if it is false, underline false: Brown is shorter than Smith. Jones is shorter than Brown. Therefore Jones is shorter than Smith. True. False.
5. How many hours will it take a truck to go 48 miles at the rate of four miles per hour? *Answer:* .... hours.
96. Underline the two words that have the same relation to each other as *December* and *January:* last first least worst month
97. On the blank spaces write the two numbers that should come next:

17 51 17 51 17 51 ... ...

98. Underline the two words that have the same relation to each other as *dress* and *woman:* neck feathers feet bill bird
99. If the conclusion to the following argument is true, underline true; if it is false, underline false. The recent panic occurred just after the president announced his policy regarding corporations in interstate commerce; therefore the president is to blame for the panic. True. False.
100. A grocer had a tank holding $44\frac{3}{16}$ gallons of oil. He drew out $15\frac{3}{4}$ gallons. How many gallons were left in the tank? *Answer:* .... gallons.

PSYCHOLOGICAL EXAMINATION

For College Freshmen and High-School Seniors

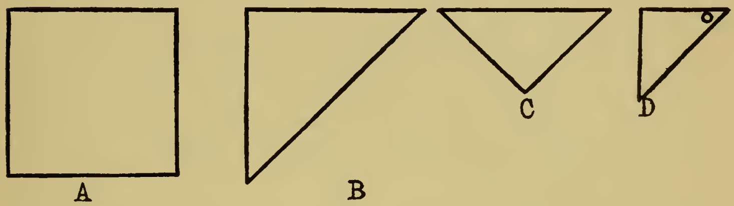
1922 Edition—Time Limit: 30 Minutes

(Instructions the same as in Part A)

1. I am facing north and turn to my right. In which direction do I turn? North South East West. (Underline the correct answer.)
2. Is it possible for any number to be larger than its square? Yes No. (Underline the correct answer.)
4. The hands of a clock read five minutes of twelve. What time would they read if their positions were reversed? *Answer*. . .
5. Is the following statement logical or absurd? Phyllis was born three years before her younger sister, Ruth. Logical Absurd. (Underline the correct answer.)

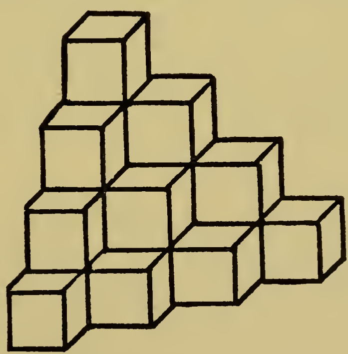
10. Which of the following words would look the same in a mirror? Underline it. NOON MOTTO MADAM TOOT ANNA PEEP.

14. Jones owes Smith one hundred dollars; Smith owes Brown one hundred dollars. The two debts will be settled if Jones pays one hundred dollars to Brown. True False. (Underline the correct answer.)



24. The piece of paper *A* is folded to look like *B*, again to look like *C*, and again to look like *D*. Then a hole is cut at a position indicated in *D*. Draw the holes in *A* to show where they would be if the paper were unfolded.

31. How many cubes would be needed to build this figure?



48. What is the smallest number of coins that can be used to give a man forty-four cents?

50. A tank of water is being drained at the rate of 2 cu. ft. per second and supplied at the rate of ½ cu. ft. per second. After two minutes there are 50 cu. ft. of water in the tank. How much water was in the tank before it was drained? Answer.... cu. ft.

51. Fill in the blanks in the following sentence. Write only one word on a blank
    The knowledge of.... ....use fire is....of....important things known by....but unknown....animals.
52. Fill in the blanks in the following:
    X is greater than Y therefore Z is....than S
    X is less than Z Y is....than Z
    Y is greater than S X is....than S
53. If one word in the following is crossed out the others can be arranged to form a logical sentence. Cross out that word.
    old is tired hard boy because the very he worked man has
56. Is the following statement logical or absurd? The time of the sun's rising seemed earlier because the hands of the clock had been turned back an hour. Logical. Absurd. (Underline the correct answer.)

Uses of Intelligence Tests.—The most recent and greatest emphasis that has been placed upon tests of mental ability as a guide to vocational placement of individuals was in the army. General intelligence tests have been very carefully worked out for the purpose of testing large groups and of making a preliminary sorting. In addition to those designed for large groups special tests have been arranged to further test the individuals in the groups determined by means of the first tests. Special trade tests designed to test the proficiency in a large variety of trades have also been prepared and given to thousands of men in the army.

Uses in Schools.—A. Perhaps the most valuable possibility arising from the use of intelligence tests in schools is that of classifying pupils in accordance with their natural intelligence, or ability to learn. The variation in this respect among the children of any grade is extraordinarily great; for instance, in almost any fifth grade (unless the children have been specially selected) there may be found children who are so bright as to be above the average seventh-grade child in intelligence, and others who are so dull as to be below the average third-grade child in intelligence. It is obviously impossible to teach fractions, for instance, either in the same words or at the same rate to children so very different in ability and degree of mental development. Wherever three or more like grades exist within reasonable distance of one another, there are very obvious advantages in sorting the pupils into three or more intelligence groups and advancing each group at its own rate. Group intelligence examination affords a ready and fairly relia-

ble means of making such classification. An hour given to the examination of each class, and six or eight hours of the teacher's or examiner's time given to scoring papers and recording results, will enable any principal or supervisor to divide his grades in this way and thus to decrease appreciably the difficulties of teachers and facilitate the progress of pupils.

Where it is impossible systematically to classify all grades according to intelligence, it may frequently be possible to establish in the community two or three classes for gifted children, and an equal number for those who are slow but not sufficiently backward to be placed in ungraded classes or in special schools for defectives. The regular classes in this way may be relieved of extreme cases at both ends of the distribution, leaving them more homogeneous and easier to handle.

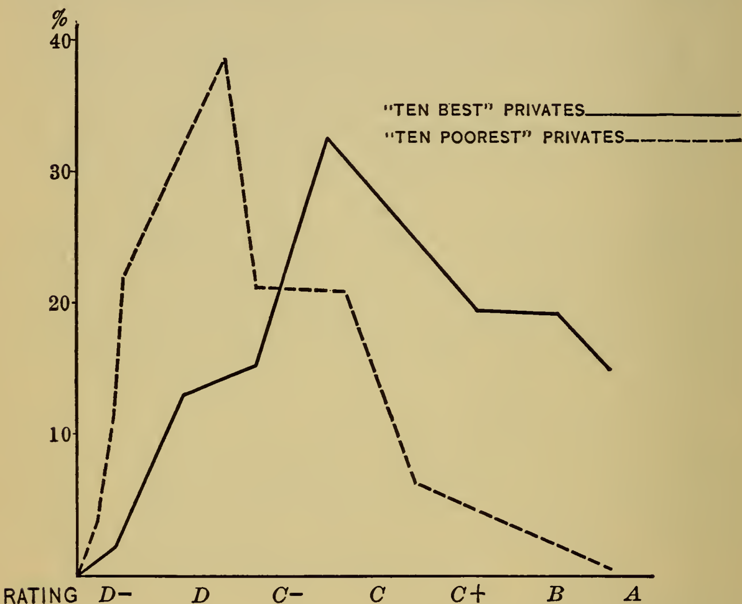
B. In the process of applying group intelligence examinations to a new class, the teacher may discover, much more promptly than he otherwise could, some of the physical and mental peculiarities or abnormalities of the children. A score on a group intelligence examination which is very low as compared with the age standard should always result in inquiry as to its cause. The trouble may be defective sight or hearing rather than low intelligence; or the low score may indicate a psychopathic condition which seriously affects the child's school work and his progress. Erratic scores, high on some tests but low on others, also indicate the need of individual attention.

C. The group intelligence examination may also give a valuable indication of the probable causes of difficulty with unusual and troublesome children—those who do not fit into the school routine. Anything unusual in the records of such children should be followed by careful individual examination for confirmation or explanation. In many cases a knowledge of the cause of the child's behavior enables the teacher to change it by comparatively simple but previously unthought-of means.

D. Vocational guidance, not to specific trades or professions, but along broad lines (for instance, to a profession rather than a trade or to unskilled rather than skilled labor), may be given with greater assurance when the results of an intelligent examination are known. The objective evidence, even when it merely confirms an impression, is valuable because impersonal and definite. (*National Intelligence Tests: Manual of Directions for Use with Scale A and Scale B, All Forms*, 1921, p. 27.)

Value of the Tests.—The various tests are generally called *intelligence* tests and are designed to discover grades of native mental ability. To a certain extent they accomplish that end. However, an analysis of all of the tests thus far devised

will reveal that to a large extent they are tests of *information* or *training*. Of course there is probably some correlation between ability and the possession of certain information. But it is perfectly conceivable that a highly intelligent person might not be able to tell where the Buick automobile is manufactured, or who wrote *The Scarlet Letter*, whether "Country



Intelligence Grades of "Best" and "Poorest" Privates. (Best 606; Poorest 583; Total, 1,189.)

Gentleman" is a kind of wheat, corn, hay, or oats. Persons of rather low intelligence might be able to give the correct answers. Of course, in all probability persons of low intelligence would not be in possession of a very wide range of information.

That the intelligence tests are fairly reliable is shown by the fact that the ratings obtained by means of them coincide very closely with other judgments regarding large numbers of men. For example, sixty company commanders were each

asked to indicate their ten best and ten poorest privates. The entire companies were also rated by the intelligence tests. The ratings were indicated by the letters *A*, *B*, *C*, etc., *A* being the highest grade. The graph accompanying shows that almost none of the poorest received a grade of *A*, while the most of them were below *C*, ranking *D* and *D*−. On the other hand, of those considered as the best, the majority received a grade above *C*, about 20 per cent ranked *B*, 15 per cent *A*, and practically none *D*. "Of the 'poorest,' 57.5 per cent graded *D*− or *D*, and less than 3 per cent *A* or *B*. The data show that a man above *C* is from eight to twelve times as likely to be 'best' as to be 'poorest'; and that a man below *C*− is from six to ten times as likely to be 'poorest' as to be 'best.' Intelligence seems to be the most important factor in determining a soldier's value to the service." (From *Army Mental Tests*, p. 14, printed November 22, 1918.)

Undoubtedly the various intelligence scales point in the right direction, but it is equally true that they fall short of the purpose intended, viz., determining the degree of intelligence or native mental ability of an individual. Most of the questions are to a large extent questions depending upon information, that is, training or education, and not just "gumption," or intelligence.

Exercises such as the following seem to test understanding or "gumption," and do not depend upon much specific information: "Arrange in order and tell whether true or false: 'Cows milk give'; 'write are with to pencils'; 'will live bird no forever'; 'external deceptive never appearances are.'" While the following depend to some extent upon certain knowledge and training, the main thing is clear comprehension and logical thinking: "How many pencils can you buy for 40 cents at the rate of 2 for 5 cents?" "If 2½ tons of hay cost $20, what will 4½ tons cost?"

The tests have been of great value in that they furnish a quick and tolerably standardized measure of comparison. They have been of special value in sifting out the feeble-minded from normal children. It should frankly be recog-

nized, however, that they do not provide absolutely definite measuring units, like a foot rule or as a pound weight. The answers all have to be interpreted, and no two examiners would evaluate them in exactly the same way. Comparative studies, however, go to show that the judgments of different examiners do not differ so widely as to invalidate the conclusions. A child's condition may vary greatly from time to time, so that the results secured at different sittings may vary considerably.

Ayres (*The Binet-Simon Measuring Scale for Intelligence: Some Criticisms and Suggestions*, Russell Sage Foundation, 1911) maintains also that:

I. The tests predominantly reflect the child's ability to use words fluently, and only in small measure his ability to do acts.

II. Five of them depend upon the child's recent environmental experience.

III. Seven depend on his ability to read and write.

IV. Too great weight is given to tests of ability to repeat words and numbers.

V. Too great weight is given to "puzzle tests."

VI. Unreasonable emphasis is given to tests of ability to define abstract terms.

Like all the intelligence tests that have been devised, they tend to test information rather than native ability or intelligence.

Caution Suggested in Interpretation of Tests.—Intelligence measurement represents a new and significant direction of scientific psychology and education. Caution needs to be exercised in the interpretation of results. The movement is in its infancy, and much more critical work needs to be done in devising tests and interpreting them. Before making sweeping changes in the classification of children and before tests are used as absolute means of determining vocational aptitudes much more work needs to be done.

Doctor Trabue, an expert in measurements, has emphasized the same idea in a recent article. ("Some Pitfalls in the Ad-

ministrative Use of Intelligence Tests," *Jour. of Educational Research*, June, 1922, pp. 2–9.) He writes:

An inadequate understanding of the scope and significance of the tests may lead to serious difficulties. "Intelligence" is a big word, and it signifies to the average person a broad range of abilities. Each of the group intelligence scales at present available involves only a few of these abilities, and no two of these scales measure exactly the same combination of qualities. We know very little about the specific traits that should be included in a comprehensive test of *general intelligence*, and still less about the relative weight that should be attached to the different tests to be included. We are certain that we do not yet have any system of tests in which exactly the proper elements are combined in exactly the proper proportions to make a perfect test of general intelligence. What then do the intelligence tests actually measure? What are the criteria by which we are judging the intelligence of pupils? As teachers we tend to think of intelligence in the rather narrow terms of school success. The child who prepares his lessons easily and well is "intelligent." The one who has difficulty in understanding words, symbols, and complex ideas is "rather stupid." Practically all of the present intelligence tests are built on the assumption that success in school work is only another measure of intelligence. The pupils who make high scores on the intelligence tests are the ones who enjoy and can easily master the books and abstract ideas offered in the schools. . . .

In view of the specific nature of the intelligence tests, it is unfortunate that the custom has grown up of speaking of one child as "superior" to another, when the only evidence of such superiority is that he has made a larger score on a given test. The evil of this custom is more clearly seen when one child is reported as "inferior" to another. How do we know that the perfect all-round intelligence test might not weight social intelligence, or mechanical intelligence, or some other type of ability, much more heavily than the academic type we now can measure? Do we know that the child making a low score in abstract intelligence might not be rated much higher if measured by a truly general intelligence test? The words "superior" and "inferior" give far too great an importance to the type of tests that are now available. College graduates in business make a higher score, on the salary scale, than college graduates in education, but we do not for that reason need to speak of one of these groups as superior to the other. . . .

Another false conclusion, drawn from the results of the so-called intelligence tests, is that pupils who make scores of a certain size will not profit by further training. The tests used are measures of a specific type of ability—the type which enables pupils to succeed at

the academic work offered in the usual public school. If a child makes a low score in the tests, it does not follow that it is useless to train him. The child may indeed have reached his maximum level in abstract work with symbols and words, but there remains an endless number of avenues through which he may broaden his experience and enrich his store of knowledge, even at his relatively low level of abstract thought. There may be other fields of training, also, in which such a child may demonstrate a relatively higher level of ability. It is certainly unfair to refuse further training to a child because the school has in the past failed to recognize the needs of pupils of his type. At the other extreme there is a pitfall of just as serious a nature —the assumption that those who make high scores on the so-called intelligence tests do not need special attention or training, because they will take care of themselves.

Doctor Guiler ("How Different Mental Tests Agree in Rating Children," *Elementary School Journal*, June, 1922), after a critical evaluation of a large number of tests, drew conclusions similar to those of Rugg. Among his suggestions are the following:

1. Mental measurements, in their present state of development, must not be accepted as the final gauge of mentality. This conclusion is made on the basis of the large amount of disagreement existing among the different tests employed in this investigation.

2. It seems unwise to attempt to estimate mentality on the basis of a single mental examination.

3. More attention needs to be given to the displacement of mental ratings. While the correlation between some of the distributions of mental ratings is marked, the lack of agreement among specific ratings in the same distribution is equally striking.

4. The greatest need in mental testing to-day seems to be the perfection of existing tests and scales.

5. Mental tests render an important service in selecting children of high and low mentality. Their usefulness is limited in the middle quartiles.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Mention some of the different types of mental abilities of school children. 2. Are the differences due to native power or training? 3. Who was Binet? 4. Who is Terman? Goddard? 5. What is meant by "I. Q."? 6. What advantage is there in classifying children by mental age rather than by chronological age? 7. Do you think one's I. Q. is constant through life? If so, of what advantage is it to know a child's I. Q.? 8. What is an "age-grade" table? What are some of the interesting facts usually disclosed? 9. Would you place specially gifted children in a special school? How else could they be given adequate advantages? 10. Do children with superior gifts always do better than others in school? In life pursuits? 11. For classification purposes how great variations in mental age might be permitted in the same class? 12. Distinguish between intelligence and achievement. 13. What is meant by diagnostic and by prognostic measurement? 14. What are the main characteristics of the "Army Intelligence" tests? How do other tests resemble them?

References for Further Reading

1. Book, *The Intelligence of High School Seniors.* Entire book.
2. Hollingworth, *Judging Human Character*, chap. VII.
3. McCall, *How to Measure in Education*, chaps. I, II.
4. Starch, *Educational Psychology*, chap. VII.
5. Terman, *The Intelligence of School Children.* Entire book.
6. Terman, *The Measurement of Intelligence.* Entire book.
7. Terman, *Intelligence Tests and School Reorganization.* Entire book.
8. Yoakum and Yerkes, *Army Mental Tests.* Entire book.

CHAPTER XX

COMPARING ACHIEVEMENT

Scales for Measuring Achievement.—It is important not only to measure and compare the *abilities* of individuals, but also to measure and compare their *achievements* in given lines. This has been done quite successfully in connection with school children's achievements in several subjects of the curriculum. The most important measurements have been made in arithmetic, spelling, handwriting, reading, and composition. It is very desirable in teaching and in school administration to know how the achievements of pupils in a certain grade in a given school compare with the achievements of the same grade in another school. It is convenient and valuable to have a means of comparing the results in the various subjects in one school system with those in another system. The scales also furnish a means of comparing the status of one grade with another.

It should be kept in mind that the scales do not indicate the ability of a given pupil or grade or school, but furnish a ready means of comparing the accomplishments of different individuals or groups of individuals. Neither do the scales indicate what ought to be taught nor best methods of teaching. These must be determined by other means. Of course, if a given method has been tried and the comparative tests show unfavorable results, then another method is pursued and favorable results follow, it may safely be assumed that the method should at least be partly credited with the better results.

Previous Methods Not Comparative.—In the past either no comparisons have been made or the methods of measuring have been very inaccurate and variable. Each person formed a judgment on the basis of his own standard. A great many investigators have recently put forth much effort in construct-

ing scales which may be used under standardized conditions, and which may be scored in the same way by different persons applying the tests. Of course absolutely the same scoring can never be given, but by the selection of materials and then by prescribing the conditions in scoring much more comparable results may be secured than when the entire judgment is made haphazard. Without definite scales and standards one teacher may judge a specimen of handwriting, for example, as "good," while another teacher may regard the same specimen as "poor." Each judges from his own particular bias. One may consider slant or angles, the other may consider height, legibility, or even have no particular criterion. Consequently the judgments of "poor" or "good" have no value comparatively. If they could compare it with many samples on a scale and decide that it corresponds to sample "60" or "80," there would be a much more definite meaning to the judgment.

Samples of Achievement Scales.—A few of the well-established scales will be indicated in order that the reader may get an idea of educational scales and their application. The scales that have been constructed and very largely used are by no means the only ones that can be made. Any good teacher who knows how to set an examination in her own work can construct scales. The most important factors in a good scale are that (*a*) it tests for specific things, and (*b*) it should be possible to give them under uniform conditions; (*c*) it should be possible to score them uniformly. The special merit of such scales as Thorndike's handwriting scale, Starch's spelling scale, Trabue's language scale, is that they have been standardized and have been given so many times and to so many pupils that they furnish a wide basis for comparing any given results.

Ayres's Handwriting Scale.—Accompanying is given a copy of the Ayres handwriting scale which has been very widely used. The detailed suggestions for using are printed on the scale. A few additional points are herein indicated.

PORTION OF MEASURING

20

Four score and seven
years ago our fathers
brought forth upon
this continent a new
nation, conceived in
liberty, and dedicat-

80

Fourscore and sev-
en years ago our fa-
thers brought forth
on this continent, a
new nation, conceiv-
ed in Liberty and

SCALE FOR HANDWRITING

30

Four score and seven
years ago our fathers brought
forth upon this continent
a new nation, conceived
in liberty and dedicated
to the proposition that all

90

Fourscore and seven
years ago our fa-
thers brought forth
upon this continent
a new nation, con-
ceived in liberty,

To secure samples of handwriting the teacher should write on the board the first three sentences of Lincoln's Gettysburg Address and have the pupils read and copy until familiar with it. They should then copy it, beginning at a given signal and writing for precisely two minutes. They should write in ink on ruled paper. The copy with the count of the letters is as follows:

Four 4 score 9 and 12 seven 17 years 22 ago 25 our 28 fathers 35 brought 42 forth 47 upon 51 this 55 continent 64 a 65 new 68 nation 74 conceived 83 in 85 liberty 92 and 95 dedicated 104 to 106 the 109 proposition 120 that 124 all 127 men 130 are 133 created 140 equal 145. Now 148 we 150 are 153 engaged 160 in 162 a 163 great 168 civil 173 war 176 testing 183 whether 190 that 194 nation 200 or 202 any 205 nation 211 so 213 conceived 222 and 225 so 227 dedicated 236 can 239 long 243 endure 249. We 251 are 254 met 257 on 259 a 260 great 265 battlefield 276 of 278 that 282 war 285.

The quality of a specimen of writing is determined by comparing the specimen with the several numbered samples in the scale and deciding which one the specimen most nearly resembles. The method advocated by Ayres is as follows:

The scorer sorts into separate piles all of the papers to be rated, putting in one pile those which he judges to be of quality 20, in another those which he judges to be of quality 30, and so on for all of the different qualities. He then carefully compares all of the papers in each pile with each other and with the samples of that value reproduced on the scale, so as to make sure that he has not included in the pile any samples that might more justly be assigned to the next higher or lower piles. (Ayres, L. P., *A Scale for Measuring the Quality of Handwriting of Adults*, p. 9.)

Another method consists in starting at the bottom of the scale and moving the specimen upward until the judge decides that a given sample on the scale is just superior to the specimen under consideration. Then the specimen is moved from the top downward until a sample is found which is judged to be just inferior to the one considered. A figure midway between the two points is then considered as the rating. For example, if in using the Ayres scale the lower figure were 50

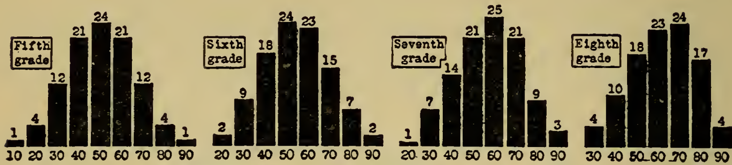
and the upper 60, the rating assigned would be 55. Sometimes several factors, such as legibility, slant, spacing, alignment, uniformity, neatness, etc., are rated separately, and then the various judgments are combined according to certain standardized methods.

On the "Gettysburg Edition" the following additional details are given:

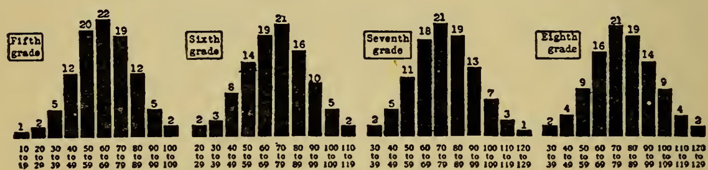
To score samples slide each specimen along the scale until a writing of the same quality is found. The number at the top of the scale above this shows the value of the writing being measured. Disregard differences in *style*, but try to find on the scale the *quality* corresponding with that of the sample being scored. With practice the scorer will develop the ability to recognize qualities more rapidly and with increasing accuracy. If the scoring is done twice, the results will be considerably more accurate than if done only once. The procedure may be as follows: Score samples and distribute them in piles with all the 20's in one pile, all the 30's in another, and so on. Mark these values on the backs of the papers, then shuffle the samples and score them a second time. Finally make careful decisions to overcome any disagreements in the two scorings.

The scale (p. 378) for measuring the quality of handwriting is a revised edition of a scale first published in 1912 and subsequently reprinted 12 times with several minor revisions and with a total of 62,000 copies. The purpose of the changes introduced in the present edition is to increase the reliability of measurements of handwriting through standardizing methods of securing and scoring samples, and through making numerous improvements in the scale itself designed to reduce variability in the results secured through its use. The present scale may be referred to as the "Gettysburg Edition" in order to distinguish it from other editions. The original or "Three Slant Edition" and the scale for adult handwriting are not superseded by the present scale. Copies of any of the three scales may be secured for ten cents each, postpaid, Russell Sage Foundation, N. Y.

The following graphs show standardized results from vast numbers of cases:

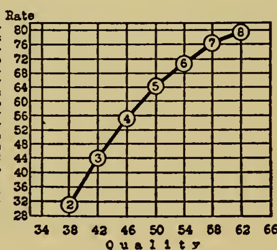


Quality of writing. Columns represent per cent of pupils in each of four upper grades commonly found to have handwriting of qualities shown below each column.



Rate of writing. Columns represent per cent of pupils in each of four upper grades commonly found to write the number of letters per minute shown below each column.

Average number of letters written per minute and average quality of writing commonly found in grades from second to eighth. Number of letters per minute in the second grade is 31, in the third 44, in the fourth 55, in the fifth 64, in the sixth 71, in the seventh 76, and in the eighth 79.



Reasons for Using Handwriting Scales.—Even when measures of handwriting are not accurate they force the teacher to give attention to the specific faults and needs of the pupils. This measurement creates a critical and scientific attitude in the teacher toward the outcomes of instruction. This attitude tends to remove the attention from personal bias and feeling to an objective consideration of the results secured. Measurement of handwriting also banishes the old false standards represented by the perfect specimens which were produced from an engraved plate. In their stead are proposed some standards which are within the reach of a majority of the pupils. Thus many children can know the joy which comes from achieving something recognized to be of value. In addition to these values measurement is destined to become scientifically accurate and thus furnish a valid basis for instruction. (Monroe, DeVoss, and Kelly, *Educational Tests and Measurements*, p. 188.)

Testing Speed in Handwriting.—In case speed in handwriting is to be measured, the amount that a given pupil or group writes in a given time is compared with the amount that has been accomplished by other groups under standardized conditions. The speed is determined by the number of letters per minute which are written. The standardized conditions usually require that the material to be written should be memorized before the speed test is taken. Of course it would be perfectly fair and comparable if the standards had been established by copying from written or printed material or from phonographic dictation at a definitely standardized rate. To have the work entirely comparable, the test material should be the same as that used in the standardization.

Various details, like good pens, ink, paper, correct position, and proper light are very important, and should be alike in the test and the standardized efforts. Familiarity with the spelling, capitalization, etc., are presupposed. The manner in which the directions are given is very important. In any test only those familiar with the test and practised in giving it should be allowed to give the directions. Monroe suggests the following directions as typical of those that have proven satisfactory:

> Write the stanza of the poem which you have learned. When you have written the stanza, write it again, and keep on writing until I tell you to stop. Write as well as you can and as fast as you can. Write on one side of the paper. When you fill one page, use another. Place your paper in position and see that your pen and ink are ready. When I say "Ready!" ink your pen and place your hand in position to write, but do not begin until I say "Start!" When I say "Stop!" all stop at once and raise your hands so I can see that you have stopped. Remember: fast work and good work. Ready! Start! At the end of three minutes, "Stop!" (Monroe, DeVoss, and Kelly, *Educational Tests and Measurements*, p. 148.)

Wilson believes that the speed test should be of only two minutes duration, and says that the most usual unit now used is two minutes. (Wilson and Hoke, *How to Measure*, p. 27.)

The handwriting scale, like other scales for comparing achievement, does not determine whether a given specimen of

STANDARD SCORE-CARD FOR MEASURING HANDWRITING

Devised by C. T. Gray

Pupil................Age................Date..................
Grade............................School.........................
Sample Number............Teacher...............................

SAMPLE	PERFECT SCORE	SCORE											
		1	2	3	4	5	6	7	8	9	10	11	12
1. Heaviness..............	3	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
2. Slant...................	5	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Uniformity													
Mixed													
3. Size....................	7	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Uniformity													
Too large													
Too small													
4. Alignment..............	8	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
5. Spacing of lines.........	9	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Uniformity													
Too close													
Too far apart													
6. Spacing of words........	11	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Uniformity													
Too close													
Too far apart													
7. Spacing of letters.......	18	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Uniformity													
Too close													
Too far apart													
8. Neatness...............	13	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Blotches													
Carelessness													
9. Formation of letters....	(26)	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
General form...........	8	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Smoothness.............	6	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Letters not closed.......	5	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Parts omitted...........	5	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Parts added............	2	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Total Score........	....	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .

handwriting is good or poor, but simply enables a judge to determine whether he regards the specimen as good, as poorer or better than the standard, or to determine what part of the scale he thinks corresponds exactly with the specimen. It must be recognized that the scale does not determine exactly, for different persons using the same scale to judge the quality of the specimen might judge differently. One person might decide by the general legibility, another by the slant, another by the spacing, another by the fineness or coarseness of the lines, another by the angularity, etc. A score-card for tabulating and evaluating results devised by C. T. Gray is appended. (Gray, C. Truman, *A Score-Card for the Measurement of Handwriting*, Bulletin No. 37, University of Texas, 1915.)

Spelling Scales.—Various spelling scales have been devised. Some of them consist of lists of selected words to be written as dictated singly, and others consist of words woven into sentences or connected material. In order to use the scales in diagnosis to compare a given pupil or group with the standardized group, it is necessary to use the same material and under the same conditions.

The standard is determined by giving the tests to a large group and finding the record for the group. Any other group or individual record can then be compared with the standardized record. The standardized record is not necessarily the ideal one. For example, spelling might be studied in Denver, and those results considered as a standardized measure. That would not mean that the accomplishments in spelling in Denver were ideal. They might be far below what they ought to be or the results might be very superior.

The results do not necessarily show anything concerning the efficiency of methods pursued. The conditions of learning may have been entirely different. One group may have had much practice, the others little; one group may have learned by the oral method, the other through writing. The test simply reveals the comparative status in accomplishment. Having discovered this, another problem is to find out why

the difference and how to remedy defects. These are much more difficult problems.

Ayres's Spelling Scale.—Doctor Ayres aimed to select words that are in everyday use. He selected words from standard literary selections, from the correspondence of 2,500 persons, from 250 different articles that appeared in four Buffalo Sunday newspapers, from 2,000 business letters, and from the family correspondence of 13 adults. From these he selected 1,000 words, which were used as many as 44 times in all of the sources.

The next step was to arrange the different words according to difficulty, in order to secure a graded test, or, in other words, *a spelling scale*. To determine the relative difficulty of the words in the 1,000 list, Doctor Ayres arranged to have the words spelled by school pupils. Fifty lists of 20 words each were constructed, and the words included in these lists were pronounced to the pupils of the various grades in the middle of the school year in the schools of 84 cities scattered throughout the United States. The data secured from these tests gave a total of 1,400,000 spellings by 70,000 school children. On the basis of these data, the 1,000 words were divided into 26 groups according to difficulty. This will be understood by reference to the scale. (See scale inserted herewith.)

Group "A" consists of "me" and "do," and these words were spelled by 99 per cent of the second-grade pupils. At the other extreme, group "Z," consisting of "judgment," "recommend," and "allege," were spelled by only 50 per cent of the eighth-grade pupils. The scale is simple and easily understood. At the top of each column is shown the average per cent of the words spelled by each grade, except that report is not made upon any grade for per cents below 50. The blank spaces to the left, however, if filled in, would indicate in each case 100 per cent—that is to say, the eighth-grade pupils spelled all of the words correctly from columns "A" to "N" inclusive. (Quoted from Wilson and Hoke, *How to Measure*, p. 6.)

Courtis's Arithmetic Scales.—The first known standardized scales for the measurement of achievement in any of the school subjects were the Courtis tests in arithmetic, first published in 1910. The series "A" consisted of eight tests, as follows: 1. Addition. 2. Subtraction. 3. Multiplication. 4. Division. (In each of the foregoing combinations 0–9.) 5. Copying fig-

ures. (Rate of motor activity.) 6. Speed reasoning. (Judgments of operation to be used in simple one-step problems.) 7. Fundamentals. (Abstract examples in the four operations.) 8. Reasoning. (Two-step problems.)

Series "B" of the Courtis tests consists of tests in the four fundamental operations only. That series has been very extensively used; one year they were used in nearly every State in the Union and in foreign countries, about a half-million copies being required. The following are a few typical examples from the tests:

Series B, Form 2.

ARITHMETIC

TEST No. I

Addition—Time: 8 Minutes

Score
No. Attempted............
No. Right................

You will be given eight minutes to find the answers to as many of these addition examples as possible. Write the answers on this paper directly beneath the examples. You are not expected to be able to do them all. You will be marked for both speed and accuracy, but it is more important to have your answers right than to try a great many examples.

(24 Examples in All)

837	996	877	572	862	267	588	236
882	320	845	253	159	854	256	578
957	778	981	948	383	684	719	877
603	886	693	529	451	358	524	916
118	913	184	936	938	938	969	543
781	164	772	223	433	333	761	593
756	897	749	358	599	493	113	956
222	972	256	676	172	775	449	439
525	119	258	122	152	239	122	309

TEST No. II

Subtraction (24 Examples)—Time: 4 Minutes

115364741	113380936	146246252	37953635
80195261	42666840	52160891	23913884

119811864	137769153	168354186	105755782
34379846	70176835	70537861	90863147

TEST NO. III

Multiplication (25 Examples)—Time: 6 Minutes

7942	4795	9245	8357	4965
72	83	86	87	19

TEST NO. IV

Division (24 Examples)—Time: 8 Minutes

92) 27784	64) 61504	83) 26643	29) 24679
57) 51642	46) 34086	75) 55500	38) 32300

Woody Arithmetic Scales.—Doctor Clifford Woody devised a set of arithmetic tests, one for each of the four fundamental operations. He says that his "idea was to derive a series of scales which would indicate the type of problems (examples) and the difficulty of the problems (examples) that a class can solve correctly." (Woody, Clifford, *Measurements of Some Achievements in Arithmetic*, p. 1.) The examples are graded in the order of increasing difficulty. "Each is composed of as great a variety of problems (examples) as the fundamental operations can well permit." In deciding upon the examples to include, he gave preliminary tests which contained more than those finally selected. Those examples "were chosen which were solved by a gradually increasing percentage of the pupils as one proceeded from the lower to the higher grades." A sample of the Woody scales is given below:

Series B

ADDITION SCALE

BY CLIFFORD WOODY

City..........County...........School..........Date............
Name...........................When is your next birthday?.....
How old will you be?............Are you a boy or a girl?.........
In what grade are you?..........Teacher's name.................

(1)	(2)	(3)	(5)	(7)	(10)
2	2	17	72	3 + 1 =	21
3	4	2	26		33
	3				35

(13)	(14)	(16)	(19)	(20)
23	25 + 42 =	9	$ .75	$12.50
25		24	1.25	16.75
16		12	.49	15.75
		15		
		19		

(21)	(22)	(23)	(24)	(30)
$8.00	547	$\frac{1}{3} + \frac{1}{3} =$	4.0125	$2\frac{1}{2}$
5.75	197		1.5907	$6\frac{3}{8}$
2.33	685		4.10	$3\frac{3}{4}$
4.16	678		8.673	
.94	456			
6.32	393			
	525			
	240			
	152			

(33)	(36)	(38)
.49	2 yr. 5 mo.	25.091 + 100.4 + 25 + 98.28 + 19.3614 =
.28	3 yr. 6 mo.	
.63	4 yr. 9 mo.	
.95	5 yr. 2 mo.	
1.69	6 yr. 7 mo.	
.22		
.33		
.36		
1.01		
.56		
.88		
.75		
.56		
1.10		
.18		
.56		

—(Published by Teachers College, Columbia University.)

Among the most widely used arithmetic tests are the *Diagnostic Tests in Arithmetic*, devised by Doctor Walter S.

Monroe, and published by the Bureau of Educational Research of the University of Illinois. The diagnostic tests are designed to yield separate measurements of the important abilities in the field of operations of arithmetic. Samples of "instructions" and tests in subtraction and in multiplication follow. In each case only correct results are counted.

Part II.—Tests 7–11.

BUREAU OF EDUCATIONAL RESEARCH

University of Illinois

Urbana, Illinois

DIAGNOSTIC TESTS IN ARITHMETIC

OPERATIONS WITH INTEGERS

Devised by Walter S. Monroe

Name..................................Age To-day............
Years Months

Race...........Sex...........Grade...........

City................State................Date.................

School........................Teacher..................

INSTRUCTIONS TO EXAMINERS

Have the pupils fill out the blanks at the top of this page. Have them start and stop work together. Use a stop-watch if one is available; if not, use an ordinary watch with a second hand, and exercise care to allow just the exact time for each test. Allow an interval of half a minute or more between tests. Require the pupils to close the folder as soon as the signal to stop is given, in order to make certain that they do not spend this rest period working on the next test. If the pupils need to sharpen pencils before going on, allow this to be done. The following time allowances must be followed exactly.

Test 7—2 minutes.
Test 8—3 minutes.
Test 9—1 minute.
Test 10—2 minutes.
Test 11—4 minutes.

Have the children read the following directions: "Inside this folder are examples which you are to work out when the teacher tells you to begin. Do not open this folder before the teacher gives the signal. Work rapidly and accurately. There are more examples in each test than you can work out in the time that will be allowed. Answers do not count if they are wrong. Begin and stop promptly at signals from the teacher. Place the test in position on your desk so that you can open it quickly when the signal is given to begin, but do not open it until the signal is given."

After all of the tests have been completed have the pupils exchange papers. Read the answers aloud and have the children mark each example that is correct "C." Count the proper spaces at the top of the tests. Examples partially completed or partially right are not counted.

Before collecting the papers have the records transcribed to the first page. The teacher should verify a sufficient number of records to make certain that the pupils have marked the papers and transcribed the results correctly.

Test	7	8	9	10	11
Number of examples attempted					
Number of examples right					

Test 9.—SUBTRACTION

At..........
Rt..........

739 367	1852 948	975 906	1087 821	516 239	962 325
508 447	1371 843	1284 966	730 508	1853 162	897 258
1910 361	735 478	1056 591	877 618	1190 739	619 257
831 360	954 483	1077 704	1328 872	939 654	1316 827

Test 10.—MULTIPLICATION

At..........
Rt..........

560 37	807 59	617 508	840 80	730 96	609 70
435 308	790 60	940 38	307 42	682 409	870 40
780 56	502 68	386 207	150 90	850 72	401 80
817 109	460 30	730 52	605 84	392 306	590 30

Most of the scales used in educational measurements are so arranged that it is possible to know of the individual or class proficiency in specific directions. Very frequently, when the usual type of tests and examinations are given, the teacher may know that the rating is high or low, but the tests are not standardized so that specific excellencies or deficiencies are revealed. A variety of abilities and skills are involved in most learning processes, which are very complex. Even some processes that seem very simple are often very complex. Ordinary problems in arithmetic involve manifold diverse processes.

Arithmetical Abilities Distinct.—A few years ago Stone investigated the nature of ability in arithmetic and concluded that it was made up of a number of specific abilities. His conclusions have been corroborated by a number of other investigations, and it is now reasonably certain that in teaching the operations of arithmetic we are attempting to engender a number of specific abilities which are relatively distinct, and not a single arithmetical ability. There are as many different abilities as there are types of examples. In fact, it is obvious that the ability to add a column of three figures is not the same as the ability to add a column of twelve figures. In adding a column of figures it is necessary that one hold in mind the partial sum until he has added the next figure. This process must be repeated continuously until the final sum is reached, and a failure to do this continuously will result in stopping the adding, at least temporarily. It is a frequent occurrence, for one who is not accustomed to adding long columns of

figures, to find that he has stopped, perhaps has even lost the partial sum, and must begin again. The span of attention required in adding three figures is short, and pupils who are able to do examples of this type with a high degree of skill frequently are unable to add long columns of figures with an equal degree of skill. In fact, we have no reason to expect them to be able to do this type of example until they have practised upon it. (Monroe, DeVoss, and Kelly, *Educational Tests and Measurements*, p. 18.)

Courtis has identified the following types of examples in the operations of integers (*Teacher's Manual for Standard Practice Tests*, 1916):

Addition: (1) addition combinations; (2) single-column addition of three figures each; (3) "bridging the tens," as 38 + 7; (4) column addition, seven figures; (5) carrying; (6) column addition with increased attention span, thirteen figures to the column; (7) addition of numbers of different lengths.

Subtraction: (1) subtraction combinations; (2) subtraction of 9 or less from a number of two digits, both with and without simple "borrowing"; (3) subtraction involving borrowing.

Multiplication: (1) multiplication combinations; (2) multiplicand two digits, multiplier one digit, and no carrying; (3) same as number 2, but with carrying; (4) long multiplication, without carrying; (5) zero difficulties; (6) long multiplication, with carrying.

Division: (1) division combinations; (2) simple division, no carrying; (3) same as number 2, but with carrying; (4) long division, no carrying; (5) zero difficulties, without carrying; (6) long division, with carrying; "first case," the first figure of the divisor is the trial divisor and the trial quotient is the true quotient; (7) "second case, where the trial divisor is one larger than the first figure of the dividend, but the trial quotient is the true quotient"; (8) "third case, where the first figure of the divisor is the trial divisor, but the true quotient is one smaller than the trial quotient"; (9) "fourth case, where the first figure of the divisor must be increased by one to get the true quotient." . . . Each of these types of examples requires a specific habit or automatism. To be sure, certain elements, such as the fundamental combinations, are common elements, but careful analysis will show that the ability to do examples of one type is different from that required to do another. (Monroe, DeVoss, and Kelly, *Educational Tests and Measurements*, p. 20.)

Doctor Courtis found that the tests were of great value in discovering individual differences among children. Not only

were variations among different individuals of the class made evident, but also great differences in the same individual. Frequently a given child was found strong in addition but weak in subtraction and division, etc. These, of course, did not determine whether or not they were native differences, but simply differences of achievement. After discovering the differences, the next step is to either attempt to reduce them if due to differences in training, or to make the most of them if due to real native differences. Courtis says:

It should ever be remembered that the chief functions of standard tests are four:

1. *Diagnostic.* To make evident the actual conditions existing in schools, classes, and individuals, that the weak points may be noted, causes determined, and remedies devised.

2. *Scientific.* To discover the natural laws of mental developments which are operative in school work.

3. *Experimental.* To make possible control experiments that will settle all questions of educational procedure upon a fact basis. (Scientific determination of the efficiency of different methods.)

4. *Supervisory.* To secure the information needed in setting standards for the guidance of teachers and schools, and in determining whether or not standards already set are being attained. (*Manual of Instructions*, 1914, p. 5.)

Geography Scales and History Scales.—While standardized tests and scales were naturally first devised for the more exactly measurable subjects like spelling, handwriting, and arithmetic, a large number of scales have been constructed for practically all other subjects of the elementary and high school curriculum. Samples of scales in two of the less-exact subjects, history and geography, are appended. The exact form of page cannot be reproduced for lack of space, but typical questions are copied verbatim. The first is from *Van Wagenen's American History Scales, Information Scale B.* There are thirty-four questions in all.

1. Who discovered the Hudson River?
2. Who was the first President of the United States?
4. Name any general who fought in the Civil War.
6. Name any one of the battles of the Revolutionary War.

8. With what country did the United States have a war in 1812?
11. Name two purchases of land that have been made by the United States.
15. Which of these first came into use in America: the railroad, the stage-coach, or the steamboat? Which one was the last to come into use?
25. Arrange these events in the order in which they occurred, by putting a "1" before the event that occurred first, a "2" before the event that occurred second, and so on until you have put a "7" before the event that occurred last. ....*Settlement of the Massachusetts Bay Colony.* ....*Adoption of the United States Constitution.* ....*Settlement of Jamestown.* ....*Battle of Yorktown.* ....*Capture of New Amsterdam by the English.* ....*Declaration of Independence.* ....*Fall of Quebec.*
29. Which of these men were in favor of a strong central government? Put a check mark (√) before their names. ....*John Adams.* ....*Alexander Hamilton.* ....*John C. Calhoun.* ....*Benjamin Franklin.* ....*Abraham Lincoln.* ....*Thomas Jefferson.* ....*George Washington.* ....*Jefferson Davis.* ....*Daniel Webster.*

From *Van Wagenen's Thought Scale B* the following are typical of the twenty-two questions:

1. During the Revolutionary War, France had helped the colonies with both men and ships. Ten years after the close of the Revolutionary War France was again at war with England. What would the French people think the United States ought to do?
4. During the winter of 1609–1610 in the Jamestown Colony, rats, mice, and snakes were relished, and fungi of various sorts were eaten. It is even reported that an Indian who had been slain in an assault upon the stockade was eaten by the poorer men. What do these statements show?
9. During the year 1824, 8,000 immigrants came to America. During the year 1844, 78,000 immigrants came. During the year 1854, 427,000 immigrants came. What do these statements show about immigration?
15. At the close of the Civil War many of the Southern negroes would not return to work on the plantations for pay, but wanted land of their own. There was also a scarcity of white laborers in the South, and but little capital with which to buy agricultural machinery. What effect would you expect these conditions to have upon the size of the farms in the South?

20. Although an agreement of peace was signed by the commissioners of both Great Britain and the United States at the City of Ghent in the Netherlands on Christmas Eve, 1814, the news did not reach America until after the Battle of New Orleans had been won by the Americans on January 8, 1815, with a loss of nearly 2,000 soldiers to the British. (*a*) Why do you think the news was so long in getting to America? (*b*) What effect would this victory of the American army have upon the arrangements for peace?

Similarly in the geography tests space forbids reproduction of the exact arrangement on the page. The *Gregory-Spencer Geography Tests*, *Form B*, consist of eight large quarto pages. Typical samples of the questions are given.

Check the right word or statement:

1. ....*Rice*....*Corn*....*Cotton* is shipped from San Francisco to Kobe, Japan.
2. ....*Gold*....*Cotton*....*Pork* is shipped from Bombay to Liverpool.
3. ....*Selvas*....*Steppes*....*Tundras* are marshy plains in the northern regions.
4. ....*The Kiel Canal*....*The Suez Canal*....*The Grand Canal* is in China.
5. ....*The Prime Meridian*....*The Equator*....*The Tropic of Cancer* is the line from which longitude is measured.
6. The capital of Chile is....*New Orleans*....*Sydney*....*Osaka* ....*Santiago*, etc.

Evaluation of Objective Tests in Content Subjects.—The foregoing tests in geography and history are very skilfully arranged so as to receive answers that must be stated definitely and unambiguously. They can also be scored quickly and accurately. It will be noted, however, that they call largely for mechanical memory. If pupils have not been drilled on the various facts called for, the tests correctly answered would show a wide range of accurate information. If the teacher has been aware that the test would be given and has drilled the pupils on these facts, it would not reveal very broad or thoughtful learning. It should be noted also that the wording of many of the questions does not call for a high order of thinking or even of fact memory. For example, it is much easier to answer "......*Rice*......*Corn*......*Cot-*

ton is shipped from San Francisco to Kobe, Japan" than to answer "Name the products shipped from San Francisco to Kobe, Japan." It is not very difficult to select the right answer from the three following statements: "Petroleum and natural gases were formed by: ......decomposition of minerals......the decaying of plant and animal bodies...... burning of vegetable matter." A much more difficult question would be: "Explain the origin of petroleum and natural gases." The "fact-memory" type of question has its place, but if limited to that type instruction must become very narrow and devoid of accurate independent thought reactions. They are the type of questions which educators have long been trying to supplant and supplement in order to enrich the curriculum. They are entirely at variance with topical teaching, project teaching, and the socialized recitation, in which there is an attempt to get away from the stereotyped forms of instruction. Doctor Walter F. Dearborn, in a recent letter to the writer, expressed the same apprehension. He said of certain arithmetic tests that "unsupported by more comprehensive tests, they have at the same time tended to narrow the work in the schoolroom." He wrote further: "We believe that the tests of various kinds now in use throughout the country are shaping the work in the schools and, therefore, that unless the movement for scientific measurement is to be brought into disrepute, the tests used must fulfil aims in keeping with modern teaching."

Difficulties and Limitations.—There are several difficulties that will make it impossible for the standardized scales to ever entirely displace the ordinary tests and examinations in the schoolroom. In the first place, no tests can be devised that will meet all needs at various times in a given subject. Each teacher must devise tests to measure progress in the particular feature of work that has been stressed. For example, a given teacher may wish to discover the diligence and faithfulness of a class in the preparation of a particular assignment. Such factors are quite as important as particular skill or knowledge. The teacher must devise the test to fit that

particular case. Of course, if the teacher is familiar with standardized scales and methods of testing, the given test will be more carefully selected and the results better analyzed than if he had no knowledge of them. Again, standardized scales can never be kept abreast of the new materials that should be incorporated in the curriculum. To entirely measure a teacher's success by the standardized scales would often do a teacher great injustice. One teacher might have his classes up to a grade in spelling the particular words of a standardized scale, or up on the addition of integers, but have very poor work in history, music, or civics, because these last are seldom measured by standardized scales. It might be that a teacher had not secured the median results with the "spelling demons" or with the "borrowing" process in subtraction, but she had taken extra time for inculcating much-needed civic and moral lessons. Her school might show splendid results in the development of a co-operative spirit, a splendid example of the development of fine, thoughtful conduct so necessary in training for citizenship. Scales for the testing of these latter have not been devised nor can they be easily quantified. All the scales test intellectual or motor results. They do not test emotions and morality. But these latter mean more in citizenship than intellectual accomplishment.

The foregoing is not designed to discourage measuring, but merely to suggest that the present tendency in scale-making and measurements may, if wrongly evaluated, discourage effort in more worthy directions. It would be desirable if the results of civic and moral education could be accurately measured, and it may be that the present development of the measurement of intellectual attainments may point the way. But let no teacher or school be wholly judged by the attainments in purely intellectual achievements. Many a teacher whose pupils would score low on "bridging the tens" has been a veritable benediction in the lives of her pupils and the community.

Only a limited number of subjects have been standardized or can be standardized so that all teachers can or should mea-

sure their pupils by the same tests. In geography, for example, pupils living in Seattle ought to spend most of their time upon geography, either of that locality or that which is related to it in some vital way. Their achievements in geography ought to be very different from those of children living in Buenos Aires. All of the geography tests thus far devised would tend to cause the beginning teacher, or the one who knows that she will be judged by the results of standardized scales, to centre upon "what will pay." The best results of geography teaching are determined (*a*) by the pupil's interest in the subject, and (*b*) his ability to use geographical helps, and to apply his knowledge to new problems. Projects in geography should not result so much in stereotyped examinable information as in increased interest and power to investigate a new situation. What standardized scales give different values for a project in Seattle or in Boston? The standardized scales all seem to put a premium upon mere information of the old stereotyped kind that we have been trying to get away from as a measure of geography study.

Unless the scales are changed frequently, teachers and pupils naturally will collect them and cram for them, and the worst sort of narrowness will result. It is noticeably true that few of the devisers of scales and standardized tests have published any relating to their own subjects. If such scales are valuable, should not every subject in psychology and education be tested and measured by some standardized scales? What teachers of those subjects would be willing to restrict their teaching so that their students could be measured by somebody else's scale?

The following comment by Wilson and Hoke (*How to Measure*, p. 192) is very significant regarding the possibilities and the limitations of standardized tests in tool subjects and content subjects:

The tool subjects of the grades are being measured with success and with beneficial results on teaching and curricula making. Can the content subjects—such as history, geography, physiology, literature, nature study, and elementary science—be measured with equal suc-

cess and equally beneficial results? The answer is that many attempts are being made, that success has not been attained, and that final success is still in doubt. A scientific test or scale for grading a subject is merely a reasonable examination which has been carefully graded and evaluated, *i. e.*, standardized. Any fixed or rigid examination scheme tends always to formalize the teaching of a subject. For the formal phases of the tool subjects this is desirable, assuming good teachers and provision for adequate motive. But can we formalize the teaching of a content subject without undesirable results, or can we apply standard tests to the more formal information phases of such a subject without its resulting in misplaced emphasis by many teachers, a large majority of them? It is very doubtful. At any rate, it remains an open question.

Equally pertinent is their comment regarding the use of standardized tests in high-school subjects (*How to Measure*, p. 213):

The reasons are: First, most of the high-school subjects are not tool subjects. They are of value chiefly because of content and appreciative values. These values are more intangible, more difficult to measure, than the simple elements involved in the tool subjects. Second, the old academic view-point that secondary work is merely preparatory is changing. The old view-point made the mastery of subject-matter, as such, the essential consideration. The present tendency, however, is to minimize the importance of high-school work as merely preparatory, to look more toward use and application, and to make of the high school a real people's school serving the broader aims of education. The efficiency of work on this basis cannot be tested nearly so well by examination methods. Even a subject like mathematics does not become a tool subject for a large percentage of pupils. Apparently, therefore, appreciative values and an understanding of the subject from the standpoint of enjoyment and perspective are just as important as the mere mastery of subject-matter. Third, it is in subjects like literature and history especially that the fact, subject-matter basis, is particularly undesirable. Literature, to be effective and to carry over into later life, must be taught on a basis of appreciation and enjoyment. It does not lend itself to rigid testing. History, likewise, deals with life problems, which depend for their development upon present-day problems, pupil interests, community contacts, and teaching equipment. So that any attempt to reduce history to a mere mechanical basis renders it of little value.

In short, standard tests and scales have proven of value chiefly in measuring the tool subjects and the mastery of subject-matter. The high-school curriculum has many other values, some of which are pos-

sibly even more important than the strictly measurable ones. It will be worth while, however, to note the development of scales in high-school subjects in so far as they have developed.

Pupils' Interest in Scales.—One of the noteworthy results of the use of scales in measuring achievement in various school subjects has been the interest which pupils have taken in the tests and results. They have compared the achievements of individuals with other individuals, with the class scores and also with the standardized scores secured by the wide use of given tests. Teachers have also been put on their mettle to enable their pupils to reach or exceed the standard scores. There is a question whether sometimes undue effort may not be diverted from other important work to the drill in types of skill required in the standardized tests.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Distinguish between tests of intelligence and tests of achievement. 2. Why is a "standardized" test more accurate than an ordinary test or examination? 3. Is a standardized test always more valid as a measure of progress than a test made by the teacher who has given the particular work? 4. What use would you make of a standardized reading, writing, arithmetic, or spelling test in a given class? 5. How are standardized test norms derived? 6. Will given norms remain permanent? 7. If pupils score high on a given standardized test, does it mean that the content is worth while? What will determine the value of the content? 8. How can we determine whether a given test is a good one? 9. Should teachers be rated by the scores made by their pupils in standardized tests? 10. Mention several of the best standardized tests in arithmetic, spelling, silent reading, handwriting, algebra. 11. Is it equally easy to construct good standardized tests in all subjects? Explain.

References for Further Reading

1. Brooks, *Improving Schools by Standard Tests*. Entire book.
2. Cameron, *Psychology and the School*, chaps. XVI, XVII, XVIII, XIX.
3. McCall, *How to Measure in Education*, chaps. IV, V.
4. Monroe, *The Theory of Educational Measurements*. Entire book.
5. Monroe, DeVoss, and Kelly, *Educational Tests and Measurements*. Entire book.
6. Parker, *Methods of Teaching in High Schools*, chap. XXII.
7. Pressey, *Introduction to the Use of Standard Tests*. Entire book.
8. Starch, *Educational Measurements*. Entire book.
9. Strayer and Englehardt, *The Classroom Teacher*, chap. XIX.
10. Strong, *Introductory Psychology for Teachers*, lesson 29.
11. Wilson and Hoke, *How to Measure*. Entire book.

CHAPTER XXI

PROPHESYING PERFORMANCE

Prophecy has always been a fascinating pastime. Because of the uncertainty and unreliability, only occasional individuals acquire a great reputation for their prophecies. Because of the mystery connected with prophecy, it has always been fascinating, and therefore many believe in prophecy. Scientific prophecy, however, is of recent development. In fact, all scientific principles include implied predictability, or, in other words, prophecy. A scientific law simply means that under certain conditions certain results will follow.

Predictability of human conduct is a science in its infancy. Undoubtedly every individual human action is determined by a sequence of previous actions, and the order is definite. Nothing happens or comes by chance. If the exact relations between effects and causes in human conduct could be worked out, and then if a given sequence of causes were known, effects could be foretold with absolute certainty. Of course in the main that is utterly impossible. But in certain limited lines the sequences have been studied so that a fair degree of predictability is possible through scientific means.

It would be of very great value if we could know whether an individual retains the same degree of mental power through life. That is, does the I. Q. remain constant through life in a given individual? If true, the possibilities of the individual could be determined on entering school and his work gauged accordingly. Terman writes (*Intelligence of School Children*, p. 149) that

> The I. Q. is sufficiently constant to make it a practical and serviceable basis for mental classification. At the same time, it is not infallible. A single test does not give us certainty, but merely a high degree of probability. While the I. Q. it yields is extremely valuable in the tentative classification of children, it needs to be checked up by supple-

mentary data and by retests. In certain types of pathological subjects, the I. Q. may undergo large fluctuations. Epileptics, for example, frequently deteriorate from something like normality to middle-grade deficiency in the course of a few years.

That rough prediction is now possible on the basis of intelligence tests can no longer be denied. For example, it is a fairly safe prediction that the child who has been competently tested by the Binet scale and found to have an I. Q. of 75 will never attain an I. Q. of 125, or that an I. Q. of 125 will never, barring definite nervous disease, drop to 75. No one would now expect a child with an I. Q. of 60 or 70 to be able to graduate from an average high school or pursue a college course. These predictions are, of course, very rough, but it is worth something to know that, in general, there is even a *tendency* for the superior to remain superior, for the average to remain average, and for the inferior to remain inferior. ("Mental Growth and the I. Q.," *Jour. of Educ. Psych.*, 13: 325, 1921.)

Terman, Rugg and Colloton, and Poull present a large amount of data (*Jour. of Educ. Psych.*, vol. 12, September, 1921) supporting the contention that the I. Q. is practically constant. Studies are cited to show that several retests of the same individuals show essentially the same I. Q. at successive periods. In general, all the studies seem to show a slight increase in the I. Q. with increasing age. Doll, Stenquist and Fermon, and Garrison question this conclusion. (Doll, *Psychological Monographs*, vol. 29, No. 2, 1921; Garrison, "The Fluctuation of Intelligence," *School and Society*, June, 1921; Fermon, "Validity of I. Q. as Established by Retests," Thesis, Columbia University, 1920; Stenquist, "Unreliability of Individual and Group Intelligence Tests," unpublished.)

Undoubtedly Terman is correct in the main. A bright child will continue to be bright if ordinary environmental conditions prevail; a dull child will remain dull no matter what the conditions; and the feeble-minded are doomed to a life of feeble-mindedness. However, we must make a variety of tests covering a sufficient variety of conditions, so as to be sure that we know that the child is bright or dull. Limited tests under adverse emotional or health conditions might indicate hopeless dulness, or limited tests that chanced to test

a special quality, like mechanical memory, or to call for special information, might suggest precocity in an average child.

Also, much allowance should be made for the fact of unevenness of growth of different individuals and of the various powers of each individual. It would probably be correct to say that each individual's M. Q. (motor quotient) is fairly constant, but every one knows that there are many fluctuations depending upon conditions of development and health. Again, much depends upon the persons making the tests. A personal equation in deciding the validity of an answer is no small factor in all intelligence testing.

A few studies have been made to discover whether there is any correlation between intelligence ratings and school grades in various studies. The results are not uniform and are somewhat conflicting. In all probability a hundred pupils scoring high with the intelligence tests would achieve much higher grades in their studies than a hundred others with low intelligence scores. A few studies will be mentioned.

Proctor found that pupils with low I. Q.'s drop out of high school in greater numbers than those with a high I. Q., although a high I. Q. is not necessarily a guarantee of success. He says:

> There are good grounds for the prediction that 75 per cent of those who test below average, mentally, will fail in more than one-half of their studies during their first year of high school; that 50 per cent of them will leave school to go to work during the first two years; and that none of them will remain to graduate. (*Psychological Tests and Guidance of High School Pupils*, p. 23.)

Professor William F. Book, director of the Psychological Laboratory of the University of Indiana, has just recently completed a state-wide study of the intelligence of high-school seniors in the State of Indiana. The results have been published in book form. He says (*The Intelligence of High School Seniors*, pp. 93–110):

> It has been generally assumed that students possessing a superior or very superior grade of intelligence can and will do a superior grade of school work. On this theory intelligence tests have recently been

used by certain universities in place of the usual college entrance examinations, and candidates are being selected for university scholarships on the basis of the records they make on intelligence tests. Pupils in the public schools have also been doubly promoted by progressive teachers and superintendents merely on the basis of the strength shown in intelligence tests.

In most of these cases such students have been successful in their academic work . . . but data recently gathered by our own laboratory indicate pretty clearly that other mental characteristics besides intelligence are important factors in determining school success. The foregoing data show that we have no right to expect a student to do a very superior type of school or college work merely because he possesses a high degree of native mental endowment. He must possess additional characteristics, such as persistence, a proper attitude toward his teacher and the school, endurance, health, and the like, to be successful with his school work. All the factors which contribute to a pupil's success or failure in school are not known. When determined, they will probably show that general intelligence is insufficient to guarantee an individual's school success. . . . The evidence seems to indicate that we are not in reality measuring the same thing when we test for intelligence and school success. . . . The correlation between intelligence scores and scholastic success in school is not very high. . . . If taken for individual cases, intelligence scores are poor criteria for predicting the kind and amount of school success that will be attained. . . . Mere ability to *learn* and *do* are not synonymous with actual performance. . . . Because a pupil has the ability to *learn* or *do* his school work, it by no means follows that he will do it. . . . A mere intelligence test is evidently no criterion for what a pupil will do in school.

Correlation between Grades in Different Subjects.—Some studies have also been made of the correlation between grades received in a given subject and those received in other subjects taken at or near the same time. It is very frequently asserted by some that if a pupil stands well or poorly in a given subject it is quite certain that he will have corresponding marks in other subjects. If differences appear, they are frequently attributed to the inability of teachers to mark fairly.

A study made by one of the writer's students, Miss Mabel Foster, when she was a teacher in the Iowa City, Iowa, High School, is given in the accompanying tables.

ALGEBRA

	TABLE I					TABLE II				
	E	G	M	P	F	E	G	M	P	F
Lat.	53	38	6	1½	0	0	13	19	9	58
Eng.	39	50	10	1	0	3	22	38	14	23
Sci.	44	51	5	0	0	0	29	37	22	12
Hist.	54	41	4	0	0	1	20	23	23	33
M. Tr.	18	69	14	0	0	2	26	41	18	13
Draw.	39	45	15	3	0	0	44	11	6	39
Arith.	55	33	12	0	0	13	49	27	2	9
Dep.	69	25	5	0	¾	26	41	23	6	4

GEOMETRY

	TABLE III					TABLE IV				
	E	G	M	P	F	E	G	M	P	F
Lat.	45	48	4	3	0	0	25	46	16	13
Sci.	30	53	11	6	0	1	12	41	16	30
Hist.	42	48	8	1	1	1	17	18	36	26
Eng.	40	46	10	3	1	0	14	24	25	37
Ger.	54	27	16	3	0	6	23	25	17	29
M. Tr.	32	68	0	0	0	5	27	43	15	10
Draw.	63	33	4	0	0	17	58	25	0	0
Dep.	50	41	9	0	0	18	40	28	8	6

Table I includes pupils marked E (Excellent) in algebra. It shows the percentage of them who received E*, G, M, P, F in each of the subjects indicated.

Table II includes pupils marked F (Failed) in algebra. It shows the percentage of them who received E, G, M, P, F in each of the subjects indicated.

Table III includes pupils marked E (Excellent) in geometry. It shows the percentage of them who received E, G, M, P, F in each of the subjects indicated.

Table IV includes pupils marked F (Failed) in geometry. It shows the percentage of them who received E, G, M, P, F in each of the subjects indicated.

* E—Excellent, G—Good, M—Medium, P—Poor, F—Failed.

The grades of all pupils who had received E (Excellent) in algebra and geometry were compared with their grades in other subjects which they had taken in high school. Similarly, the grades of all who had failed in algebra and geometry were compared with their grades in other subjects. The tables show that pupils who received high marks in algebra and geometry were more likely to receive fair or high grades in other subjects. However, there were many individual variations, thus making it impossible to say absolutely that a given pupil who ranks high or low in a given subject will certainly have a similar rank in other subjects.

Correlation between Grades in Lower Schools and in Higher.—Quite a number of studies have been made of the correlation between grades received in the elementary school and in the high school, also between those received in the high school and college. To a lesser extent the correlation between success in school achievement and in life after college has been studied. A few of the most important studies will be cited.

Dearborn compared the high-school grades of 472 pupils from eight Wisconsin high schools with their grades at the University of Wisconsin. (*The Relative Standing of Pupils in the High School and in the University*, 1909.)

He studied "all those who entered from the eight high schools during the years 1900 to 1905, inclusive. The basis of comparison is the general average of the marks secured by each pupil in high school and in the first two years of the university." A group of 180 students included in the 472 were followed throughout the four years at the university also. The comparison is made of this last group between the standing in high school and the standing in each of the four years at the university. (Pp. 10–11.)

He says (p. 19):

Of these 472 pupils, only 5 who stood in the lowest quartile of the group on entrance succeeded in reaching the rank of the first quartile, and they secured only the lowest grade in the quartile; similarly, but 5 of those who entered in the first quarter of this large group dropped to the lowest quarter during the freshman year, and they stood in the highest grade of this quartile. . . .

And the opposite facts are nearly, if not quite, as true; the chances are but about one in five that the student who has done poorly in high-school work—who has been in the lowest quarter of his class—will rise above the median or average of the freshman class at the university, and the chances that he will prove a superior student at the university are very slim indeed.

The striking facts about this comparison are, first, the extent to which those who were in the first quarter of this group in high school maintain relatively the same position in the freshman year, and, secondly, the somewhat less-marked tendency of the lowest quarter of the high-school class to be limited to the last two quartiles of the

freshman year. The interchange between the middle quartiles is, as remarked above, much more extensive.

What is true of the standing of students in the high school holds in just about the same proportions throughout the sophomore and junior years. About ninety-three students have dropped out of the freshman group before the sophomore year. . . .

From an inspection of this first series of charts we are justified in drawing the general conclusions that *those students who are the best scholars in the high school are, usually, the best in the university, and, similarly, that the poor scholars in the high school tend to remain so in the university.* (Pp. 21, 22.) . . . This investigation indicates very clearly that the previous rank of pupils in the accredited school furnishes a satisfactory means for forecasting the likelihood of successful work at the university. (P. 44.)

He says (p. 41) that

A little over 80 per cent of those who were in the lowest or highest quarter of the group in the high school are found in their respective halves of the group throughout the university. . . . We may say, then, on the basis of the results secured in this group, which is sufficiently large to be representative, that if a pupil has stood in the first quarter of a large class through the high school, the chances are four out of five that he will not fall below the first half of his class in the university. (It may be of interest to the reader versed in statistics to add that the Pearson coefficient of correlation of the standing in high schools and in the freshman year of 472 pupils is plus 80 per cent.) (P. 21.) . . . Rank in high school has, therefore, as is to be expected, a definite relation to the question of elimination in the university. It is evident from these results that a student entering the university from these schools with a rank or general average of 85, or above, for example, is much more likely to continue through freshman year than one whose high-school rank was below 85. In this case, there were 244 (56.9 per cent) of the group who attained this or a higher rank in high school, but 29, or 12 per cent, of them drop out during freshman year, whereas of the remaining 228, 64, or 27.5 per cent, are eliminated. (Pp. 39, 40.)

Dearborn found that many more of those entering with low standings were eliminated from the university during their freshman year than of those who entered with high standings. He says:

As was to be expected, the larger number who drop out are found in the lower quartiles. Out of the group of 472, 93, or 19.7 per cent, leave during freshman year, and 43, or 12 per cent, during sophomore

year, showing a total of 136, or 31.7 per cent, eliminations in the two years. In other words, about one-third of the group were eliminated in the first two years of college.

About 50 per cent of these are from the lowest quarter of the class, 23 per cent and 17 per cent from the third and second quarters, respectively, and less than 10 per cent from the first quarter. Similar percentages hold in the high-school quartiles. . . . Only 15 per cent of those eliminated in freshman year were in the first quarter of their high-school classes, whereas 42 per cent of them were in the lowest quarter of the high-school class. The eliminations of the sophomore year are much less dependent on high-school standing, and correspond more closely with the university standing.

Walter R. Miles (*Pedagogical Seminary*, December, 1910), one of the writer's students, made a comparison of the grades of pupils in the elementary schools and in the high school. That study revealed in a definite way that there is a high degree of correlation between the accomplishment of pupils in the lower schools and in the high school. That would not be expected as much as between the grades attained in the high school and in the university. Between the high-school period and the university period of study, there is not as great a developmental change, and habits and methods of study have become more fixed. He compared the records of 106 pupils during the last four years of the elementary school with their records during the four years of high school. He was able to follow fourteen of them into their university work. While this group was too small to furnish conclusive evidence, the results are corroborative of those obtained by Dearborn, Smith, and others, and are quite significant.

Another one of the writer's students, Franklin O. Smith, made a study of the high-school and university grades of 120 students. ("A Rational Basis for Determining Fitness for College," *Pedagogical Seminary*, 19: 137–153, June, 1912.) He followed much the same plan as Dearborn, but instead of dividing the entire group into quartiles, he divided it into quintiles (fifths).

He says:

On the basis of the general averages in the high school and in the university it is seen (Table I) that more than one-half (54 per cent)

of the pupils who were in the first or highest quintile in the high-school grouping remain in the corresponding quintile in the university grouping, and that somewhat less than half (42 per cent) of those in the fifth or lowest quintile in the high-school grouping are in the same quintile in the university grouping. Furthermore, 29 per cent of those in the first quintile are in the upper half of that quintile, while only 16.5 per cent of those in the lowest quintile are in the lower half of that quintile. That is, 12.5 per cent more pupils move up from the lowest positions in the high school to relatively higher positions in the university than move down from the highest to relatively lower positions.

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General Averages, University

HIGH SCHOOL	1ST Q. %	2D Q. %	3D Q. %	4TH Q. %	5TH Q. %
1st q	54	16.6	16.6	4	8
2d q	25	29	16.6	12.5	16.6
3d q	16.6	25	21	21	16.6
4th q	0	25	25	33.3	16.6
5th q	4	4	21	29	42

Foster says (*Should Students Study?*, pp. 28, 29):

We may take, for example, all the students who graduated from Harvard College during a period of twelve years and entered the Harvard Medical School. Of the 239 who received no distinction as undergraduates, 36 per cent graduated with honor from the Medical School. Of the 41 who received degrees of A.B. with high honor, more than 92 per cent took their medical degrees with honor.

Still more conclusive are the records of the graduates of Harvard College who during a period of twenty years entered the Harvard Law School. Of those who graduated from college with no special honor, only 6½ per cent attained distinction in the Law School. Of those who graduated with honor from the college, 22 per cent attained distinction in the Law School; of those who graduated with great honor, 40 per cent; and of those who graduated with highest honor, 60 per cent. Sixty per cent! Bear that figure in mind a moment, while we consider the 340 who enter college "with conditions"—that is to say, without having passed all their entrance examinations—and graduated from college with plain degrees. Of these men, not 3 per cent won honor degrees in law. . . .

So difficult is it for a student to change his habits of life after the crucial years of college that not one man in twenty years—not one

man in twenty years—who was satisfied in Harvard College with grades of "C" and lower gained distinction in the studies of the Harvard Law School.

The same relation appears to persist between the promise of Yale undergraduates and their performance in the Harvard Law School. If we divide the 250 graduates of Yale who received their degrees in law at Cambridge between 1900 and 1915 into nine groups, according to undergraduate scholarship, beginning with those who won the highest "senior appointments" at Yale and ending with those who received no graduation honors, we find that the first group did the best work in their studies of law, the second group next, the third group next, and so on, in the same order, with but a single exception, at the bottom of the list. The performance at Harvard of each of the eight groups of Yale honor graduates was in precise accordance with the promise of their records at Yale.

President Lowell, of Harvard, has studied the records of Harvard students from 1895 to 1901 who graduated first from Harvard College and then later graduated from the Law School or the Medical School in the same university. He concluded that the grades attained in the college are fairly indicative of the rank the same men will receive in the professional school. "The men who are destined to take the highest rank in the law and medical schools are markedly better scholars, both in the preparatory schools and in college, than their fellows. In intellectual power, as in other things, the boy is father to the man."

Doctor Alexander C. Roberts, one of my students, recently made an extended study of the predictive value of intelligence tests and high-school records in relation to university achievement of a group of students rating "D" and "E" on intelligence tests.* He has kindly furnished me a summary in the following statement:

Summary of Factors in the Prediction of University Scholarship.—This study leads conclusively to the fact that no one measure of student ability is adequate in prognosis of academic success at the university. The high-school scholarship record is the best single measure, but various studies indicate that the high-school record is far from accurate as a sole basis of prediction. A progressive scheme of

* *Bulletin*, University of Washington.

intelligence testing is at present the best supplement to scholarship records. This study of 581 "D" and "E" students, the lowest 15 per cent in the intelligence ratings at the university, shows that the "D" and "E" students have exactly five and one-half times more probability of failure than has the student from the groups above. Furthermore, any adequate system of admission must attempt to secure a reliable estimation of character traits—ambition, perseverance, determination, optimism, idealism, etc., for we have found plain inferences that highly desirable character traits carry many mediocre students to scholastic success and undesirable character traits wreck the accomplishments of brilliant students. Much maladjustment may be avoided through proper reports upon the special activities, interests, and abilities of those students who have brilliance or high skills but very narrow interests and talents. And finally the record of failures in high school is an accessible and predictive factor of great value. This study indicates that students of only moderate mental ability who have not failed in any high-school subject have a chance of two and one-half times greater that they will not fail in any university subject than that they will fail in as much as one-fifth of their university work. One or two semesters of failure in high school make little difference, but the students who come to the university with records of three or more semesters of high-school failure have three times greater probability of failing in one-fifth or more of their university work than they have of failing in no university subject.

It is possible to predict closely the academic success of students entering the university, and the bases of prediction are these: 1. The high-school record of subjects passed. 2. The high-school record of subjects failed. 3. The high-school record of activities, interests, and talents. 4. The best subjective estimation of several high-school teachers upon character traits. 5. An intelligence rating determined in a scientific manner either in high school or at the beginning of the university career. 6. An evaluation of the university marks of the first quarter in the light of all these other measures.

Foster (*Should Students Study?*) made a careful study of the class of 1894 in Harvard College to discover the relation between grades in college and success in later life. Twenty-three men were considered by competent judges to have attained distinguished success in later life. A comparison showed that those twenty-three men had received 196 "A's" in college, while twenty-three other men selected at random had received but 56 "A's." A study made at the University of Oregon showed that of the highly successful graduates 53

per cent had been good students and only 12 per cent weak students. Among the graduates who were considered as unsuccessful, 52 per cent had been weak students and only 12 per cent had been good students.

Similar studies from Bowdoin, Wesleyan, Yale, and Oxford all show that high-grade students generally become successful men and low-grade students have much less possibility of achieving success in later life. A study of *Who's Who* shows that the majority of persons therein listed were high-grade students in college.

Hollingworth (*Vocational Psychology*, p. 205) says:

> On the whole, then, all these studies point in a consistent direction; those who are destined to achieve distinction and success begin to do so at an early age. Whether measured by achievement in academic courses, honors in professional and technical courses, salary earned after graduation, or inclusion among lists and directories of eminent men, success in later life is suggested by success in the early work of the school curriculum. In spite of frequent comments to the contrary, the school curriculum would seem to constitute a useful test in prognosticating at least the most probable qualities of the individual's later work.

This does not mean that students could not change the pace at which they are going. Of course the dawdler may have ability to go faster, but the habit of dawdling has become so fixed that the chances are that the pace at which he is now running will be the pace at which he runs later in life.

I have no statistics to prove my opinions concerning the correspondence between the gait at which my classmates in college were going and their later performance, but rough observation seems to show me that those who were hard-working, persistent students are now the ones who are accomplishing things in life, and those who were dawdling and frittering their time away are now doing essentially the same type of thing. Of course there are notable exceptions. But the college journal is wrong when it says: "Never mind, the student who is loafing now will be the man of distinction to-morrow, and the poor grind will be left behind in life's race." Facts

do not bear out any such conclusion. Oliver Wendell Holmes said: "By 45 one must have carved his name on the scroll of fame or shut up his jack-knife."

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. What is the popular notion regarding the relation between ability in childhood and success in adult life? 2. Have you heard of persons who were dunces in childhood and geniuses in maturity? What is your opinion? 3. What is the average college student's belief concerning the relation between college grades and life's success? 4. Plan a study that would really give a scientific answer to such questions. 5. What parts of the problem have been fairly answered? 6. What parts are most difficult? Why? 7. Do the same qualities that insure success in school studies insure success in life?

References for Further Reading

1. Book, *The Intelligence of High School Seniors*, chaps. IV, V, VI.
2. Foster, *Should Students Study?*, chaps. IV, V, VI.
3. Hollingworth, *Vocational Psychology.* Entire book.
4. Terman, *The Intelligence of School Children.* See Index.
5. Roberts, *Studies in Intelligence Ratings and Scholarship Records at the University of Washington.* Entire monograph.

CHAPTER XXII

VOCATIONAL PSYCHOLOGY

Importance of Vocational Guidance.—The vocational guidance and education of youth forms one of the most important phases of the education of to-day. This is true, first, because the entire life career of most boys and girls depends upon the efficiency of this aspect of their education; and, second, because the welfare of society to such a large extent depends upon it. No other part of education is so full of interest to the youths themselves as that which bears upon their life-work. Also, no other part of the education of youth has as much interest and concern for society. If the schools convince the pupils that the school activities will contribute to increased vocational efficiency, the pupils are at once interested. Likewise, if parents and patrons are convinced that the schools really develop vocationally efficient men and women, they are ready to support the school generally. On the contrary, disbelief in the effectiveness of schools in producing vocational expertness causes parsimony in supporting the schools. There is great importance of educational wisdom in (*a*) convincing the public that youth is the time for vocational guidance, and (*b*) in demonstrating that educational experts can diagnose pupils accurately and guide them wisely in vocational selection and training.

Meaning of Vocational Education.—Vocational education is to be interpreted broadly in this discussion. It is not to be limited to mean manual-arts work, looking toward gaining a livelihood. It is not to be limited to the trades or crafts. In fact, the meaning is altogether too narrow if it is limited to the material means of gaining a livelihood. Living is far broader than the securing of food, shelter, and raiment. Living includes spiritual attitudes and aspirations, as well as

satisfaction of bodily needs. Living includes intellectual, æsthetic, and moral exercise and enjoyment as well. Complete living involves concern for and satisfaction in promoting the welfare of others as well as of self. It includes not only self and even one's own immediate family, but one's community, one's state, one's nation—humanity.

A real vocation comprises all of one's life-work, which enables him to realize all of these complex results. Therefore in considering vocational education we must give consideration not only to the means of physical livelihood, not only the means of earning enough to maintain a family and a respectable place in a community, but we should be equally concerned with an education which will enable the individual to realize the larger possibilities of life as well. This is too often lost sight of. Short-sighted reformers are too much concerned over a kind of narrow trade-training and skill, and too little with developing broad-minded men as well as workers. There is to-day more danger of spiritual starvation than of bodily starvation. The bread-line is not the great menace to-day. The menace is the unhumanitarian attitude of those who have developed skill and shrewdness and who are depriving others of their rights to reasonable human happiness. The great concern of labor to-day is not trade education (training), but to stimulate the workers to take an interest in the great world problems. It is gratifying to note, too, that the ranks of labor are making tremendous strides in this direction. They are becoming so wide awake on great questions of human rights and justice that the soulless "interests" are becoming tremendously alarmed. This very attitude must be stimulated to the utmost through the right kind of vocational education.

It is just as important to provide vocational education for the children of the well-to-do and even the wealthy as for the poor. In many ways it is more necessary to do so, for the poor will naturally from necessity be stimulated to select a life occupation. The rich, not being under the economic necessity of working for a livelihood, do not centre upon any-

thing to develop permanent interests. The workers, in attaining mastery of an occupation and in following that occupation as a means of livelihood, develop a view-point of labor and its purposes that tend to make them humanitarian and sympathetic. The one not compelled to learn a vocation or to ply it as a means of livelihood becomes contracted in vision, unsympathetic, and lacking in humanitarianism. Consequently vocational education and training is necessary for all. All need to be taught the means of livelihood and also to perform honest work and render service, whether under the necessity of doing so or not.

Much interest has been developed in the last few years in the question of intelligent vocational guidance of young people. When industrial life was relatively simple and limited to a narrow range of occupations, the boy naturally either followed the vocation of his father or drifted by chance to some other life-work. Most of the skill required in a given occupation was secured at home by participation or through the apprenticeships. Girls received all their training in the home, because the home was their future destiny. As the industries have multiplied and become specialized to a very high degree, the selection of a career has become a matter of great importance.

Formerly it was believed that a general education was wholly adequate to enable each one to select wisely and to gain equipment for his life-work. Now, as the training for many occupations is so specialized and so extended, it becomes highly important that the individual select the right occupation and make no unwise detours in acquiring the preliminary training and an opportunity to enter the chosen career.

In recognition of these conditions much time and thought have been expended upon developing vocational guidance bureaus, training vocational guidance experts, and in establishing vocational guidance departments in connection with school systems. The success of the effort depends in the main upon four factors: (*a*) the successful survey and exhibition

of the various fields of human endeavor, (*b*) a discovery of the qualities necessary for success in the various occupations, (*c*) a diagnosis of each individual's aptitude, and (*d*) the provision of opportunities to enter upon the career for which one is fitted.

It is not the purpose of this chapter to be a syllabus on the technic and details of vocational guidance and training. It is rather to attempt to present a point of view and an interpretation of the meaning of a vocation and its relation to the period of youth. Undoubtedly the largest factor in vocational guidance is the arousal of a genuine ambition to succeed and to make the most of oneself, and the desire to render service to society. Therefore, the problem is a psychological one—a problem of knowing how to stimulate and guide instinctive ambitions at their periods of nascency. The furnishing with technical equipment is a relatively easy one compared with this.

Psychology in Vocational Guidance.—While recognizing that much has already been accomplished by psychological methods in vocational guidance, a word of caution must be given. Because of the great value of the intelligence and trade tests given in the army, the wildest assumptions are being made by quacks and charlatans for commercial purposes. There is now almost as much of a belief that there is some wizardry in psychology as there was in astrology in the Middle Ages. To many of the multitude psychology means some uncanny clairvoyance or hypnotism. Quacks make use of this credulity and are reaping great harvests of lucre thereby. Self-styled "psychologists" are giving lectures to large groups of business men on the "psychology of success," the "psychology of efficiency," etc. "How to Read People on Sight, to Impress Them, Convince, Persuade, and Understand Them" is the title of a series of lectures said to have been given to as high as 3,000 persons in one city, and similar numbers in other places. The audience were taught "How to know, at a glance, the amount of any individual's capacity—the ideal head for success to-day." "Leanings and long-

ings which we imagine we conceal from the world are printed in the shapes of the eyes, mouth, nose, jaw, and forehead." "How to discover what has been holding you back." Then there are "memory experts," "will-trainers," etc., galore. The following is an illustration of the type:

> SALESLADIES, ATTENTION! The shortest distance between two given points is a straight line. Don't guess at your customer. It is not profitable, practical, nor necessary. You can learn how to read people at a glance. Ten evening lessons will make you a successful character analyst. Increase your income. Come in and get the names of my successful students. They will be glad to tell you what the course has done for them. New class begins November 1st. Office open every evening this week, 7:30 to 9 P. M. Visitors welcome. ——, expert character analyst.

Manifestly all such assumptions are pure "bunk." The belief in such wizardry, however, is a very natural aftermath of the war emotionalism. Everybody was in a high tension emotionally, and then important results had actually been achieved by scientific psychologists in sorting men into groups for occupational placement. Because of that remarkable success quacks and charlatans have seized the psychological moment to exploit their nefarious art. At no other time in a century has it been so easy to peddle psychological bunk as at the present.

Those who had most to do with the development of intelligence testing in the army and its application to vocational placement are the most modest in their claims regarding its values. However, a real beginning has been made and the opportunity must not be lost to develop further a real science of human analysis.

Analysis of Individuals.—All possible available means and methods of studying the qualities of individuals should be employed. If it were possible to know accurately all the powers and characteristics of an individual and also the qualities necessary for success in any particular occupation, then it would be a relatively easy matter to establish vocational guidance on a scientific basis. There are many claims and assumptions

made by quacks and pseudoscientists. But it must be confessed that the day is far distant when anything approaching complete scientific accuracy has been reached.

Intelligence and Vocational Intentions.—Several studies have been made to discover the relation between intelligence of high-school pupils and the vocations which they aimed to follow. Book found in his Indiana study that the high-school seniors who had made vocational choices were slightly higher in intelligence than those who had not made such selections. The difference, however, was not great. He found that the boys selecting various occupations ranked in intelligence as follows, starting with the highest: scientist, minister, journalist, lawyer, engineer, teacher, business man, physician, farmer, mechanic, stenographer. A similar study of high-school girls showed the following order: journalism, law, social service, medicine, teaching, entertaining, home-making, clerical work, music and art, nursing.

Studies made at the University of Washington on students who are actually in training for their vocations indicated that engineering students scored slightly higher than the all-university medians. Those preparing for teaching also scored higher than the all-university medians. Engineering students led all other occupational groups. The army studies showed that the professional classes scored much higher than those in clerical, mechanical, and day-laboring classes.

Intelligence of Seniors and Parents' Occupation.—Book and others have studied the relation between the intelligence of pupils and the occupations of parents. He found the following order of intelligence scores from the different classes of parents' occupations: professional workers, clerical workers, skilled artisans, salesmen and clerks, business executives, day-laborers, farmers. This needs to be studied much more exhaustively, especially from the economic point of view. It should also be studied through several generations to see what types of occupation seem to produce the highest types of intelligence.

Thus far only a few tests have been devised which really

determine exactly fitness for a particular pursuit. Perhaps only three tests have any great degree of reliability, viz., tests for musical talent, ability to become an aviator, and ability in typewriting and stenography.

Seashore Tests in Music.—Seashore, who has spent most of his professional life in the study of sound, has devised a set of tests of musical ability that are doubtless very reliable. By use of specially prepared phonograph records it is possible to test certain basic factors in musical ability. His tests are divided into two series, the first series including tests for (*a*) the sense of pitch, (*b*) the sense of intensity, (*c*) the sense of consonance, (*d*) musical memory. A more refined series includes tests for the measurement of (*a*) timed action, (*b*) rhythmic action, (*c*) motility, (*d*) singing in pitch. (*The Psychology of Musical Talent*, 1919, par. VIII.)

The tests have been standardized and are very easy to give. The sounds necessary for study are all recorded on graphophone records prepared by the Columbia Graphophone Company. Seashore has prepared manuals of instruction so that any one can readily give and score the tests, even though unmusical himself. "The measures are so adjusted as to be easy enough in parts for the poorest listener, and difficult enough in parts for the best listener." (*Manual of Instructions and Interpretations for Measures of Musical Talent*, p. 4.)

In the first test the listeners hear two tones differing in pitch. They are to judge whether the second is higher or lower than the first. Ten trials are usually given. Suitable blanks are furnished so that pupils can easily record their judgments. In the second, sense of intensity, the listeners hear two tones which differ in loudness or strength. They are to judge and record whether the second is weaker or stronger than the first. In judging sense of time three clicks are sounded, marking off two intervals of time. The listeners are to judge and record whether the interval between the second and third clicks is longer or shorter than the interval between the first and second. In testing the sense of consonance the following instructions are given:

To the listener: You will hear two combinations of two tones each; one combination is better or worse than the other in consonance (harmony). A good combination is one in which the two tones are smooth and blend, tending to fuse together into one. A bad combination is just the opposite. If the second combination is better, record B; if worse, W. This calls for judgment on blending, smoothness, and fusion, apart from the feelings of like or dislike, and apart from theory or feeling of musical value. Blending, smoothness, and fusion should be explained fully, and may be illustrated on the piano before the preliminary practice. (*Op. cit.*, p. 15.)

Tonal memory is tested in the following manner:

To the listener: In each trial you will hear a series of tones played twice. In the second playing one note is changed. You are to record by number which one was changed. In listening count mentally; for example, 1, 2, in the first playing, and then likewise in the second playing, so that you may identify the one that was changed without error. There should be preliminary drill for each span of the five degrees of difficulty, with emphasis on the silent counting. (Seashore, *Manual of Instructions and Interpretations for Measures of Musical Talent*, pp. 14, 15.)

As illustrations of individual surveys of musical talent, two individual record charts are reproduced from Seashore's *The Psychology of Musical Talent*, pp. 19, 21.

Theodora.—Theodora has a decidedly musical mind. In the three basic capacities for musical hearing—the sense of pitch, the sense of intensity, and the sense of time—she is superior and well balanced. Her sense of consonance is of a high order. Her acuity of hearing is only average, but this condition is not of the type which will affect music seriously in view of her superior sense of intensity. Her imagery is all of the moderate type. Her auditory imagery can be developed as an excellent support to her superior sensory powers, and the motor and visual imagery are prominent enough for an emotional background in music. Her lowest record is on motility, which is characteristic of the fact that she has a deliberate type of mind and is steady in her movements. Her physique is average, as indicated by her grip and ergogram. Her precision of movement and her simple response to a simple signal are slightly above average; while her simple response to a complex signal is decidedly better. Her capacity for

serial association of sound and action is good; whereas her association for visual impressions and action is barely above average. Her timed action and her rhythmic action are both good. Her general motor reliability is superior. She sings in key with remarkable ability and reproduces the interval with superior precision, although her voice control is only moderately good for nuances of pitch. She has a good voice register and an excellent voice quality. Her tonal memory is decidedly superior. She gives superior promise for speed and reliability in the acquisition of skill in music. Her associations are highly versatile and remarkably well balanced, but not peculiarly musical. Her mental age is fully two years in advance of the normal. Emotionally she is cool and undemonstrative, but capable of deep feeling for music.

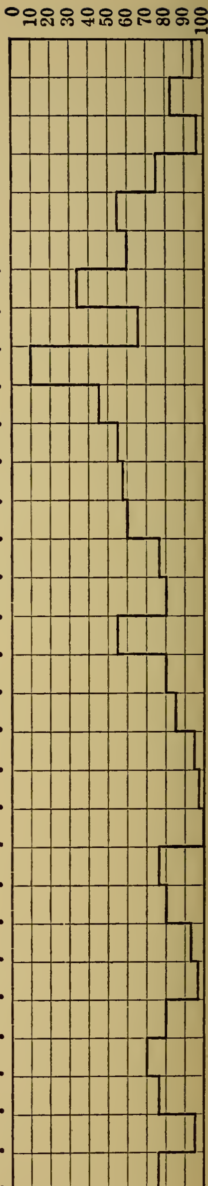
Generalizing from the above, we observe that Theodora has a rare balance of high sensory capacities for music, that she is of the strongly intellectual rather than of the motor type of mind, and that, therefore, she is not so skilful in performance as she is in hearing, appreciation, and intellectual control. Her motor responses are of the slow, deliberate, and reliable type.

Theodora belongs to a decidedly musical family and is given excellent musical advantages. On account of her remarkable versatility in other respects, she approaches music, like other interests, in a matter-of-fact attitude.

Rosabelle.—Rosabelle is not of the musical type of mind. She has an average sense of pitch and an inferior sense of intensity, but a rather good sense of time. She possesses but a slight sense of consonance. Her acuity of hearing is below the average. She has but little auditory imagery, but her motor imagery is pronounced and her visual imagery average. She has good general motility. Her physique is slightly above average. In precise movements and in simple reaction she is above average, but her complex reaction is superior. Her auditory serial action is below average, while her visual serial action is very good. She is decidedly inferior in timed action and poor in rhythmic action. In general motor reliability she is superior. Her capacity for striking the pitch of a note is inferior, although she sings the common intervals with a moderate accuracy and her voice control of pitch is fair. She has a fair register of voice, but the quality is inferior. Her memory for tones is not quite up to the average. Although she has very good capacity for visual-motor learning, her auditory-motor learning curve is below average. Her musical associations are superficial, although she has a fertile mind and her mental age is above normal. Although otherwise quite emotional, she is but slightly moved by music.

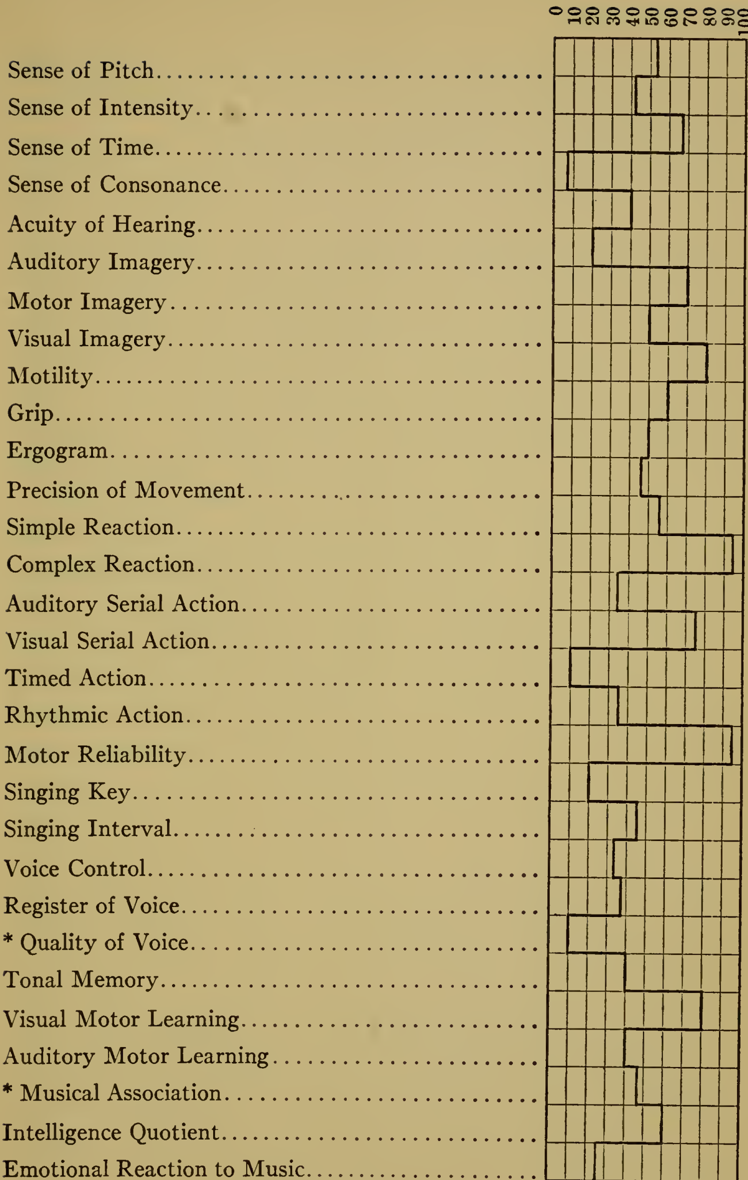
Summarizing the characterization, we find that Rosabelle is of the

Sense of Pitch
Sense of Intensity
Sense of Time
Sense of Consonance
Acuity of Hearing
Auditory Imagery
Motor Imagery
Visual Imagery
Motility
Grip
Ergogram
Precision of Movement
Simple Reaction
Complex Reaction
Auditory Serial Action
Visual Serial Action
Timed Action
Rhythmic Action
Motor Reliability
Singing Key
Singing Interval
Voice Control
Register of Voice
* Quality of Voice
Tonal Memory
Visual Motor Learning
Auditory Motor Learning
* Musical Association
Intelligence Quotient
* Emotional Reaction to Music



TALENT CHART OF THEODORA

* Estimates.



TALENT CHART OF ROSABELLE

* Estimates.

intellectual-motor type, normally emotional. She is but slightly ear-minded and does not live in a tonal world or respond effectively to musical sounds and associations.

Rosabelle takes a superficial interest in music and associates with musical children, but her musical reactions are scarcely emotional or artistic.*

Tests for Stenographic Ability.—Various tests have been devised to diagnose ability in stenography and typewriting. A considerable degree of correlation has been found between ability to spell and success in stenography and typing. The one who cannot spell cannot satisfy employers, and consequently one's rating in a standardized spelling scale is quite indicative of success in typing from dictation or from stenographic notes. Ability in spelling would affect both accuracy and speed in the work.

Lough found that a substitution test, in which certain characters had to be replaced by certain others, according to a certain key, was a good index of typewriting ability. (See Hollingworth, *Vocational Psychology*, p. 112.)

Some regard the Trabue completion tests as having special significance in relation to diagnosing transcription ability. For example, there is a similarity between making out one's notes in which some words are illegible and supplying missing words in a mutilated sentence like "The......is shining ......and we may......on our picnic." (See Link, *Employment Psychology*, p. 92.) For diagnosing speed and accuracy, undoubtedly some form of reaction tests, both simple and complex, would be very important. After the processes have become somewhat mechanized, the work is largely that of reacting in a given way to a given stimulus.

Tests for Ability in Telegraphy.—Thurstone found that: "The general intelligence tests are not as valuable for diagnosing ability to learn telegraphy as for measuring general intelligence. Ability in telegraphy is probably a special ability." ("Mental Tests for Prospective Telegraphers," *Jour. of App. Psych.*, 3: 110–117, June, 1919.)

* Seashore, *The Psychology of Musical Talent*, pp. 18–21.

Proctor says: "Minute charting of abilities by means of psychological and trade tests is not practicable at the present time for the public school counsellor." (*Psychological Tests and Guidance of High School Pupils*, p. 49.) In the National Business Ability Tests an attempt is made to discover aptitudes by exercises that are as nearly like the types of business experience as possible, that is, by an exercise in spelling, copying, following directions, arithmetic, etc. (Cody, *Commercial Tests and How to Use Them*, 1919.)

Relation between School Grades and Vocational Success. —A general consideration of the correlation between school grades and success in life careers was given in the chapter on "Prophesying Performance." A recent study is here mentioned.

Kohs made a study of Reed College students "to determine to what extent Reed College could have predicted the progress of 116 of its students who entered the service of the army or the navy. The data upon which such predictions might have been based would have been, (*a*) the quality of their college work, and (*b*) faculty estimates regarding, (1) their physical qualities, (2) their intelligence, (3) their leadership, (4) their personal qualities, and (5) their general value to the service." He compared the foregoing college success with their several ratings in the army on Armistice Day.

On the basis of the foregoing comparisons, he concluded that

(1) School marks are rather inefficient instruments for determining whether a student will make good progress in the army.

(2) Human judges, with all their frailties, are, on the whole, more efficient prognosticators of progress than the school marks which students obtain.

(3) Of all the criteria for prophesying success, the safest are, first, judges' estimates of value to the service, and, second, judges' estimates of intelligence. (Kohs and Irle, "Prophesying Army Promotion," *Jour. of App. Psych.*, 4: 73–87, March, 1920.)

In the search for artificial standardized tests have we not somewhat overlooked the significance of the regular school

curriculum and the records of grades made by pupils as a means of determining vocational fitness? It is true that the curriculum has been and often still is unrelated to life, but are not the records of mastery in school work more closely correlated with post-school performance than we have been wont to think?

Several important investigations have been made with rather significant results. Among them are those of Dearborn, Miles, Smith, T. L. Kelley, and Foster.

All of these studies serve to show in a forceful manner that the performance of a pupil in any given stage of school work is a fairly good index of what his performance will be later on in similar activities. Not only is this true, but the studies by President Lowell and several others seem to show that there is a positive and rather high correlation between accomplishment in school and in later life.

Because of these positive correlations between earlier and later performance, the very best vocational test for any given line of work is study and training in that work. The degree of success attained in the initial stages is a fairly good index of later probable success. Of course the preliminary test must be carried on for a sufficiently long period of time to test adequately.

While the study of the curriculum in school is quite different in many respects from the work demanded in many vocations, the correlations between school success and success in later life seem to indicate that the school work is a fairly good vocational test. Of course it would be still better if it could include at least the elements of the fairly well standardized vocations. Through their sampling of these their bent for a variety of work could be studied fairly well. Such prevocational experience would be far superior to any of those usually exploited in books on vocational guidance and by "character analysis."

Brewer says:

> School examinations may be much improved, and may in time become the best of all "psychological tests." If the psychological inves-

tigations were made in the actual schoolroom in co-operation with the teachers, it seems likely that much more progress would be made than we can hope to make with researches apart from the school. Thus the psychologist may study the interests of pupils as expressed in their choices of studies, games, and subjects for oral and written composition; aid the teacher in grading for difficulty a series of lessons in arithmetic; study the correlation between school marks in English and in science; help the teacher in planning better examinations in geography; plot individual learning curves for records in a series of examinations in stenography. The co-operation of the trained psychologist, the vocational counsellor, the teacher, the employment supervisor, and the employment manager, may in time yield some examinations which will aid in the work of selecting a vocation. (Brewer, *The Vocational Guidance Movement*, p. 102.)

Brewer further says:

Laboratory tests may for the present be abandoned, so far as vocational guidance is concerned, and actual standardized work tasks substituted. The records of the child in such tasks, and his capacity for improvement, if a series of tests can measure it, may be taken as a basis for forecasting the probable success. (See Thompson, 1915, *Report of U. S. Com. of Educ.*, p. 291.)

What May be Done in Vocational Guidance.—In the absence of definite standardized tests which will indicate unequivocally the bent of a pupil's mind, what can be done to provide vocational guidance? In the first place, all teachers and others concerned with the future welfare of the child should be studying him to gain even scraps of information or suggestions concerning his interests and aptitudes. This should not all be left to a vocational counsellor who is supposed to possess such wizardry that he can pass all the children in review and in a few minutes determine what each one is destined to become. All teachers should regard it as a part of their function to study each pupil with vocational ends in mind. All should co-operate with parents and the vocational counsellor in accumulating and evaluating as well as possible the knowledge that will be helpful in the final determination of a vocational choice.

Other Qualities besides Intellectual Ability.—It has been assumed apparently by many writers on vocational guidance that the general intelligence quotient is sufficient to determine vocational aptitude. This is very fallacious because a given general intelligence might be used in a variety of directions. A high degree of intelligence is undoubtedly necessary for success in law or medicine, but the same intelligence might succeed in engineering or finance.

For example, a successful stenographer needs good eyesight, good hearing, quickness of perception, quickness of muscular reaction, a good memory, ability to spell, a good knowledge of English; the broader the knowledge of literature, history, geography, science, current events the better; should know how to write; should have mastered the technic of stenography, the typewriter; should know how to file letters, manipulate the mimeograph, etc., etc.

But do the possession of all these abilities and skills insure absolute success as a stenographer? Most stenographers are in reality secretaries, and their success depends upon many factors. In addition to intellectual ability and muscular skill necessary to succeed, various other qualities have equally important places. Important among these are interest in the work, state of health, habitual temper, punctuality, loyalty, neatness, courtesy, tact, honesty, integrity of character, ability to make friends and keep them.

Principal Jesse B. Davis, who has had such a rich experience in counselling high-school pupils, writes very suggestively of some of those other qualities demanded by business men. He says:

Principals and teachers are constantly being asked to answer letters of inquiry and to fill out blank forms regarding the qualifications of some graduate or former pupil who has used their names for references in applying for some position of trust or responsibility. Among the questions asked are the following:

Has your acquaintance with the applicant been sufficiently intimate for you *personally* to judge his character and habits?

To the best of your knowledge does the applicant use, or has he

ever in previous years used, intoxicating drinks, tobacco, morphine, or opium?

Does he use vulgar or profane language?

Is he industrious, careful, thorough, honest, truthful, trustworthy?

Have you ever heard that the applicant was suspected of intemperance, gambling, speculating, extravagance, dishonorable conduct?

Do you consider the applicant a safe and proper person to be guaranteed by this company, and one whom you would yourself trust? *

The character of these questions indicates the fact that employers and bonding companies are vitally concerned with the moral qualities of applicants. I have often been called upon to find a young man for a certain position. When I asked the employer whether he wished the applicant to know certain things, he invariably replied: "We will teach him the things we wish him to know. What I want you to do is to help me find *the right kind of a fellow*." Further evidence of the demand of industry and commerce for moral qualities is found in the following questions taken from application blanks:

Are your habits sober and temperate? Have they always been so? Do you use liquor or narcotics of any kind? If so, what?

Do you use tobacco? smoke cigarettes?

Have you ever played cards for money or engaged in any other form of gambling?

Have you ever "played the races" or speculated, and do you now occasionally speculate?

Have you any tastes or habits which are extravagant in proportion to your means?

Have you ever been convicted of any crime or misdemeanor or arrested on any charge?

These application blanks would show from their content that the employer is far more concerned with the character of the applicant than with his record of scholarship. It suggests that we ask ourselves the question: "With which are we more concerned?" (Davis, Jesse B., *Vocational and Moral Guidance*, pp. 15, 16.)

Davis comments further:

To be a leader in one's vocation a man must be socially efficient. In this age of co-operation, of combination, and of systematic organization, practically every occupation among men has its association for the purpose of promoting the vocational interests of its members. These societies need the direction of wise and competent leaders. The management of great business enterprises, too, is demanding a large number of men who are not only skilled and well informed regarding

* The Personal Record Press of Kansas City, Mo., has prepared a splendid chart of these questions and others for the use of schools, etc.

the business, but also able to handle men. In fact, wherever we look in our present complex life we see the need of efficient leaders.

The public schools have neglected the development of people to meet this need. In time past every effort was made by school authorities to suppress the social instincts of the pupils, in the blind belief that the schools existed for the instruction of the intellect alone. (Davis, Jesse B., *Vocational and Moral Guidance*, p. 119.)

In vocational guidance the big thing is to stimulate and awaken the boy or girl to a genuine desire to be somebody and to do something worth while in life. As I have gone to many commencement occasions I have seen mottoes over the stage like "Rowing, not Drifting." I have often wondered and doubted a good deal whether the majority of high-school graduates were really rowing. They were equipped with much potentially useful knowledge and skill, but how much desire had they to use it for the benefit of society?

It is important to ask how much of that knowledge and skill had been obtained by their own initiative and energy, and how much by being compelled to be in school and to get set lessons. No one is vocationally educated who acquires his skill through external compulsion. On graduation day it is more important to know how much zeal, earnestness, and determination the boy has than to know how much learning and skill he possesses. These latter acquisitions are not unimportant; they are potentially exceedingly valuable, but the other qualities far outweigh them. The possession of skill does not necessarily imply the self-determination necessary for success. The development of a habit of initiative, thoroughgoing honesty, kindliness, will enable one to overcome the temporary handicap of lack of knowledge of a trade or craft.

Consequently vocational guidance and training must not overlook the psychological aspect. The development of an attitude toward life, its problems, rights, and duties is more important than the skill or handicraft and infinitely harder to develop. A teacher can stand over a boy with a club and make him acquire proficiency in learning arithmetic or a craft,

but no amount of compulsion can put him in the right attitude toward life. The golden rule is learned in far more subtle ways.

Who Should Give Vocational Counsel?—The task of vocational guidance of youth should not rest upon a single individual called the vocational counsellor. There may be one director in a school system, but every teacher should regard it as a part of his educational problem to help the pupil to find his niche in life. The problem is so complex and important that it requires the combined wisdom of all teachers, friends, and the pupil himself to make a wise choice.

Ultimately the one to make the decision is the individual himself. No other person can make it wisely for him. The pupil should be assisted, stimulated, guided in every possible way, but will can only be developed to the maximum by personal choice. Even if some mistakes are made, the personal choices are better for his development than any prescriptions furnished by outsiders, no matter how wise they may be. Therefore, the most important function of vocational guidance is to train the pupil to study himself.

One of the means of enabling the pupil to select wisely is to give varied opportunity for sampling various lines of activity. This is exactly what the real junior high school is intended to accomplish. Instead of giving finished skill in any one line it furnishes opportunity for trying many. In this way interests and aptitudes are discovered.

Davis writes:

> The problem of analyzing the applicant is possibly the most difficult part of vocational counselling. It is the most dangerous phase of the work, and the counsellor should enter upon it with fear and trembling. Human judgment is frail, and experimental psychology has not yet been reduced to an exact science. There are many psychological and physiological tests that can be made to prove an applicant's unfitness for certain occupations. Some special keenness of the senses may serve to indicate fitness for a specific employment, but many are sceptical regarding the practical results that as yet have been obtained. The field of experimentation is still open before us, and in time the data gained may prove to be a most important adjunct to the equipment of the vocational counsellor.

The advice of the counsellor should rarely if ever be positive. By this I mean that the process of counselling should be more often in the negative, eliminating the various paths or vocations which are evidently impossible for the applicant or for which he is without doubt unfit. Then by being carefully guided through a process of self-analysis, he may be led to catch a vision of his call to service. The counsellor must draw out from his applicant his innermost desire; he must inspire him with self-confidence and a lasting determination to make the most of his opportunities. Faith, not in the counsellor but in himself, is the essential factor. For this reason the counsellor must keep himself in the background and skilfully guide his client toward the realization of his own vocational aim. (Davis, Jesse B., *Vocational and Moral Guidance*, p. 142.)

Age of Choosing a Career.—One of the most important educational questions that could possibly be considered is that concerning the most advantageous age for acquiring the skill and technic necessary in one's life-work. There is great divergence of opinion among educators and still greater difference of opinion among nations. European nations have all in practice begun vocational education at a very early age. This has been especially true in the trades and crafts. Naturally those who have been destined to enter the professions have had a long preliminary training and have received their special professional training later. But even in the case of those who have gone into the professions, the special training has been secured at an earlier age in European countries than in the corresponding profession in this country. Many of our educators and professional men have considered that European practice was right and American practice was wrong. Notably ex-President Eliot of Harvard has been convinced that our young men in America get into their professional work several years later than they should.

The manufacturer is very apt to decide the matter hastily and from the standpoint of business interests alone. He wishes to employ operators who know how to do certain mechanical things in the most efficient manner. This is, of course, perfectly worthy. However, very frequently in his short-sightedness he demands that the main effort of the pub-

lic school shall be directed toward producing trained and skilled workmen. He often decries the public schools if pupils do not measure up to this standard. He fails to measure them by any other standards.

Even granting that skill and technic are desirable possessions for every pupil when finally launched into the world of competition, when is the appropriate time for their acquisition? One of the most important fruits of education is to teach the boy to want to stay in school as long as possible. Will the early learning of a trade do this? Usually one of the motives stimulating the pupil to acquire a trade is the desire to get into a gainful occupation. To plunge the boy or girl into gainful occupations too early is to limit their possibilities of development. Real education is to awaken and unfold latent potentialities. Skill means acquired habits and fixed ways of acting and behaving. Whenever a habit has been fully developed it tends toward fixity instead of flexibility of behavior. Real education should produce versatility instead of fixity of action. Real education should promote plasticity.

Consequently from a biological standpoint education should seek to give the individual a variety of experiences, only a few of which most necessary to everyday existence should be mechanized. How to walk, how to use a knife and fork, the forms of the multiplication table, etc., should be thoroughly mechanized, but the form of reasoning out a problem in arithmetic, knowledge of history, geography, and literature, how to deal with social situations, should never be learned in forms and formulas.

Distinction between Vocational Guidance and Skill.—A distinction should be made between vocational guidance and the acquisition of finished vocational skill. As soon as mastery of any process is secured, fixedness of habit is the result. Fixedness is the opposite of education. Plasticity and ability to take up new processes should be the end sought in all education. Therefore too early entrance upon the acquisition of vocational skill is contrary to the idea of education, *i. e.*, the unfoldment of all the powers and potentialities of the individ-

ual. While every opportunity possible should be given for coming in contact with and sampling a variety of vocations, the acquisition of final skill should be postponed as late as possible. We should aim to keep boys and girls in school as long as possible, acquiring new ideas and skills, and postpone the acquisition of skill in the life-work as late as possible. This is really the underlying principle of the junior high school.

Brewer says:

> Counsellors are sometimes asked the question, "At what age should the vocation be chosen?" by anxious parents or "practical" friends of the child. It is impossible to answer; generalization here is quite gratuitous. Yet the dangers connected with too early or too late choices are serious.
>
> The enrichment of the school programme will undoubtedly furnish an educational guidance which will disclose aims and abilities much sooner than would the narrow programme. Yet the child has only a child's experiences, and there are certain occupations whose requirements and opportunities can hardly be appreciated by a person under twenty-one; for example, those of the lawyer, the statesman, the social worker, the college teacher.
>
> The problem can be solved only by opening wide the opportunity for education and range of choice: by increasing the vocational infancy of all those young persons who are likely to profit by the delay of choice. The test to be applied should be progress in profitable lines of applied study. The prevocational age for certain occupations may be extended into the twenties. Note that the prevocational idea involves *work*. There is only gain to the individual and to society from profitable, supervised work, if such work is educational in its functioning and effect. Thus, the future statesman may run errands, the lawyer wire a house, the preacher lay a cement sidewalk, and the college president work as clerk in a store, all with educational profit to the individual and to society. (Brewer, *The Vocational-Guidance Movement*, pp. 125–126.)

Opportunities for Rechoice.—The choice of a vocation by the pupil should follow some study of the world's work and some attempt on his part to ascertain his own aptitudes. He should make such a choice early enough to enable him to make some preparation for that vocation before leaving school. One of the main advantages of an early choice is that it gives definite purpose to much school work and gives the pupil vital interests around which he will organize many ideals which otherwise would make but passing impressions upon him.

It is of the greatest importance that these early choices should be regarded by both pupil and school as provisional. There should be every encouragement for the pupil to revise his choice whenever increased insight into either the world's work or his own aptitudes or a new conception of service to be rendered indicates that some other vocation would be preferable. For this reason, among others, curriculums should be so organized as to permit change from one to another with the minimum of loss, and all curriculums should be conducted in the same high school, so that pupils may be encouraged and not hindered in making desirable readjustments. (*Vocational Guidance in Secondary Education*, U. S. Bu. of Educ. Bulletin, 1918, No. 19. "Guidance in Choice and Rechoice of a Vocation," p. 20.)

"Do early choices persist?" Peixotto (p. 82) thinks that vocational clews of a reliable sort begin to manifest themselves between the ages of 11 and 14 years. Thorndike has computed for 100 individuals the resemblance between relative interests and relative capacities as 0.9, and between interest in the last three years of the elementary school and capacity in the college period as 0.6. He concludes: "These facts unanimously witness to the importance of early interests."

It is always unsafe to apply conclusions based on averages—or on 60 or 90 per cent—to the individual case. We can never know which is the exception. Too many "average" boys and girls have broken the rules of averages. A case from a current magazine illustrates the way late choices are made. The Polish novelist Stanislaw Przybyszewski went to Berlin in 1889, at the age of 21, to study architecture. He soon changed to the study of physiological psychology, but in 1891 became editor of the *Berlin Arbeiter-Zeitung* and leader of strikes in Silesia. In Berlin he began to write on philosophical subjects, at the age of 30 became editor of a literary magazine in Cracow, and thence went to Warsaw and devoted himself to drama. He is now engaged in writing novels and in lecturing.

As we remarked in another place, a person's aim is likely to change as he proceeds in study and work, and his period of vocational exploration may be extended so long as he is occupying the time in ways profitable to himself and society. A forced choice might lead to unhappiness and disaster. (Brewer, *The Vocational-Guidance Movement*, p. 127.)

SUMMARY

The guiding aim in education should be to enable the individual (*a*) to reach the highest possible development of all his powers, (*b*) to select a career of usefulness and happiness, and (*c*) to be of the utmost service to society. In order to assist individuals to accomplish these aims it is necessary for the teacher to know (*a*) the aims of education, (*b*) to understand the capabilities (and limitations) of each child, (*c*) the various vocational needs and opportunities, and (*d*) to understand how to utilize the various means of stimulating each individual to appropriate forms of response or behavior.

The foregoing chapters are designed to assist the beginning teacher in accomplishing these complex results. To fully comprehend the desirable ends of education demands much careful analysis and constructive thinking. At the present moment educational objectives are very vague and ill defined in the minds of people at large. Many teachers do not consider it their business to help clarify these. They should, however, be sincerely concerned with such problems. The clearness with which they think on these matters will determine largely their interest and usefulness in the profession. Teachers usually assume that skill is necessary to impart instruction, but they often overlook the necessity of understanding the child as a means of acquiring skill in teaching. They need to know in a scientific way the endowment of the child and the psychological laws of the development of these native powers and potentialities. In addition the teacher should be a close student of society and its manifold activities in order to help pupils to know in what directions they may utilize most advantageously for themselves and society the talents they possess.

SOME SUGGESTIVE QUESTIONS FOR FURTHER STUDY

1. Distinguish between vocation and merely getting a living. 2. Get clearly in mind the meaning of vocational education, vocational training, vocational guidance, vocational placement. 3. Enumerate the kinds of knowledge a teacher would need for each. 4. Which objective seems to

be uppermost in the minds of people at the present time? 5. President Farrand is reported as saying that "The schools must get rid of a great deal of vocational nonsense." What did he probably mean? Evaluate. 6. Enumerate your own dominant traits and see if you know in what occupations they would be advantageous. 7. Do the same for some acquaintance. 8. What do you think of the "characterologists"? 9. Enumerate the qualities that seem to contribute to achievement in learning: the multiplication table, geometry, philosophy, history, manual training. 10. Enumerate those qualities that make for success as a farmer, private secretary, minister, actor, business manager, typewriter, architect, lawyer. 11. What do you think the school could and should do in vocational guidance?

References for Further Reading

1. Brewer, *The Vocational-Guidance Movement: Its Problems and Possibilities*. Entire book.
2. Book, *The Intelligence of High School Seniors*, chaps. VII, VIII, X, XI.
3. Hollingworth, *Vocational Psychology*. Entire book.
4. Foster, *Should Students Study?*, chaps. IV, V.
5. Bloomfield, *Finding One's Place in Life*. Entire book.
6. Münsterberg, *Psychology and Industrial Efficiency*. Entire book.
7. Seashore, *Vocational Guidance in Music*. Entire book.
8. Snedden, *Vocational Education*. Entire book.
9. Hollingworth, *Judging Human Character*, chaps. IX, X, XI.

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